ARTICLE VII.

ON THE CONTENTS OF A ROCK RETREAT IN SOUTH-EASTERN PENNSYLVANIA.

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Read before the American Philosophical Society, June 21, 1878.

The retreat or shelter in question is in the anticlinal axis at the base of a cliff of Potsdam Sandstone (quartzite), fronting the river Susquehanna at the iron manufacturing village of Chickis, named from a stream (the Chikiswalungo), which enters the Susquehanna at this point, about 390 yards north of the retreat. See Plate XV.

A traveler by the railway, which passes in front, may observe a vaulted recess open to the light of day, where formerly the occupation of arrow-making was followed. It is about seven feet high in the middle of the arch in front, whence it slopes north, south, and east, to the ground, much as an oven declines in all directions from the mouth, the space occupied by the recess being about ten by fourteen feet in extent, and here most of the implements were found; but some from the earth a few feet beyond the opening have been included as pertaining to the general deposit, for a fragment of pottery occurring within the recess would be matched by one or more pieces from the outside. The cavity is due to the falling away of stones forming the anticlinal curve, several of which were removed in clearing the space, and, to prevent accident, one which seemed ready to fall was detached from the roof. No stalagmitic material was present.

This paper being devoted chiefly to a detailed illustration of the implements found, the reader is referred to a preliminary sketch of the retreat and its contents, sent to the Société des Américanistes in 1877;* and to a verbal communication made to the Academy of the Natural Sciences, Philadelphia, in March 1876, from both of which, necessary material will be reproduced, adding the results of later researches.

Such stone implements as are found singly on the ground, or are turned up by the plow, are regarded by Sir John Lubbock (Prehistoric Times, 1875, p. 105), as of "comparatively little scientific value: it is only when they occur in considerable numbers, and especially when associated with other remains, that they serve to throw much light on the manners and customs of ancient times." The Chickis retreat has

* Published 1878, in the Compte-rendu, vol. 2, pp. 319–327, with a figure of the Retreat.

these advantages, the relics being numerous, varied, and illustrative of a restricted locality, occupied perhaps not less than two thousand years, if we may judge from the thirty inches of black mold formed by decaying vegetation,* and the corroded condition of many of the arrow-heads and chisels occurring at various depths.

The place was adapted for the residence of savages. The base of the cliff at the river margin left a defensible passage-way; on the north the land spread into arable soil; a large spring about 170 yards north of the shelter offered good water, and near it was a trap (dolerite) bolder of the drift of several tons weight (from the Conewago Hills ten miles to the north)—with a depression adapted for grinding corn—perhaps in part artificial, or deepened by use. Here then were shelter, defense, convenience, planting, hunting, boating, fishing in two streams, and forest.

Residing at the locality, it had been my intention for more than forty years to search the recess for relics, and at length, in January, 1876, I began scraping with a garden hoe, and soon turned up five fragments of pottery from the depth of a few inches. The next day a workman dug for me, but objects were scarce, the first being an unbroken pebble adapted for throwing, of a kind of which many afterwards occurred, either entire, or with a chip broken off (Pl. 12, Fig. 8), as if to try the texture for arrow points. An idea soon spread that the search was for money, which caused a rush and prevented the proper investigation by strata. However, as there was about the ordinary type of Pennsylvania forms, the result has not been materially altered.

Although hammer-stones were possibly the first stone implements, yet from the importance of a cutting edge, we may be allowed to surmise that the choosing of a sharp fragment, the forming of a sharp margin, at first by blows, subsequently by rubbing, and (not to lose the result of his labor or the independent use of his hands) the supplying it with a pocket, suggested proprietorship to the savage, and made the fiscal idea the first condition of civilization.

CHAPTER I.

KNIVES. PL. 1.

Stone implements which require a cutting or scraping edge, whether knives, chisels, scrapers, borers, or arrow-heads, are of several kinds; the first includes naturally sharp fragments, of which Fig. 16 may be an example; the second variety

*The stain of the black mold is still visible upon the rock, and I have indicated its limit by lines of red paint, for future reference. Dr. Abbott (Am. Naturalist, Feb., 1876, p. 67) estimates that it requires thirteen centuries to accumulate ten inches of vegetable mold.

has the form and edge roughly shaped by a few blows (Fig. 15, 17); the third variety includes such as have an edge formed by fine chipping, as in Fig. 4, the left side of which is a cutting edge, and the base a scraper; Fig. 5, delicately chipped on one side, the other flaked into a bevel at the same angle; and Fig. 14, with a cutting and scraping base, the edge transversely curvilinear. (Figures 13–17 represent specimens made of white quartz.) The fourth variety is made up of flakes struck from a hard material, such as porphyry (Fig. 1, 11), trap (Fig. 3), indurated clay* (Figs. 6, 7, 8), jasper (Figs. 4, 9), or cherty limestone (Fig 5). Finally, the fifth variety is due to rubbing or grinding (Pl. 2, Fig. 4), and polishing (Pl. 2, Fig. 8).

As the rock of the locality is a dense quartzite with occasional large veins of white quartz, any unworked specimen of either, occurring in the Retreat, might be due to a fall from above, or other accident, even after the inhabitants had left, and on this account I have collected but few of such doubtful specimens. On the other hand, as there is no sign of a drift deposit in the retreat (except perhaps the unmixed yellow sandy clay of the foundation), human occupants must have introduced stones of other material, such as indurite, jasper, sandstone, chert, siliceous slate (Fig. 12), and limestone, the last being vicinal, but as it does not take a good edge, it was not much used.

The sharp edges of the examples figured indicate that they were knives; the obtuse and transversely curvilinear edges indicate scrapers; Figs. 1, 2, 3, seem to have been pointed for the additional function of boring; and the grayish-white quartz specimen Fig. 13, 13*a*, has been carefully chipped into a concavo-convex form narrowing to a lateral point; with an edge on each side, constituting a kind of knife (perhaps used with a handle), the curvature of which suggests that it was a skinner. Compare Evans, Stone Implements, p. 317, Fig. 268.

In the knife, Fig. 12, the inferior or convex margin forms the edge, which continues to the narrower end, the upper, concave margin being obtuse, and at right angles with the sides: material gritty slate.

The bur which often appears at the point where a sudden blow is given in breaking off a flake, is seen at the upper or narrow end in Fig. 10; and curved forms from the same cause appear in the trap specimen, Fig. 3, in the porphyritic specimen, Fig. 11 (a point of which I have polished to exhibit the material), and in the indurite (indurated clay), examples Figs. 6, 7, 8.† The last mentioned material pertains to the Drift, and came from the Conewago Hills ten miles north. The name indurated

*For convenience, this rock will be called *indurite* in these pages. It will include baked (but not vitrified) clays, often due to the vicinity of trap masses, and usually hard enough to scratch glass.

†See Lubbock, Prehistoric Times, p. 85–89, on similar forms, and the mode of making them in Australia.

clay might imply lack of hardness, but the material has been metamorphosed by the Conewago trap, which seems to be present in the flake, Fig. 3. This indurated clay is black when fractured, and gray when weathered.

Some of the knives figured exhibit great age, particularly the trap or dolerite, Fig. 3. Of Figs. 6, 7, 8, the first has the sharpest lines, while they are least distinct on Fig. 8, representing probably one of the oldest of the specimens found, as it occurred not only below the thirty inches of black mold, but below the surface of the yellow clay. Occurring with cognate forms and material, and among the results of human skill, its reference to the hand of man rests on a different basis from that of a chance specimen from field or shore.

CHAPTER II.

CHISELS. PL. 2.

What are here called chisels are also known as Celts—a term which should be restricted to the people who bear this name.

Figure 1 represents a rude implement of gray sandstone, probably from the mountains north of Harrisburg. Apparently shaped from a river pebble; one end has a straight edge suited for cutting, the other is obtuse and curved, adapted for scraping, both ends coarsely shaped by hammering, and inefficient from the first, unless spoiled by use. Greatest thickness about an inch, and the thickest specimen of those figured. Hard enough to scratch glass.

Fig. 5, a hard, fine-textured, pale, bluish, siliceous shale, flake-shaped by hammering; margined with a sharp but irregular edge. Less rude than Fig. 1; average thickness about half an inch.

Fig. 6, a well-finished chisel of ruddy quartz; without polish, but the marks of chipping scarcely apparent: edge in good condition; sides sharp; base truncate. It has no indication of age, and I think it occurred about a foot from the surface.

Figs. 2 and 7, apparently of Conewago dolerite; each originally finished with a rubbed or ground edge, which, with the entire surface, has become roughened and gritty by long corrosion. In 2, the edge surfaces are slightly convex.

Fig. 3, of indurite; the rubbed or ground edge of its early state, and the entire surface, have become harsh (but not gritty) from corrosion, which has removed part of the original surface, leaving fine veins and small nodules of a harder material to project from the new surface. When similar objects occur in fields or along rivers, the wear of the surface is attributable to friction and erosion; here, the action is not mechanic but chemic.

Fig. 4, sandstone; some evidence of the rubbed edge remains.

Fig. 8, a rather regular chipped chisel; terminal edges and a medial portion from end to end polished: one edge in good condition, the other battered. Although the edge surfaces seem too convex for serviceable cutting, the skill of the workman appears (as in modern axe-grinding) in the uniformity of the surface. A dense indurated clay, scratching glass, and admitting of a fine polish: no indication of age: thickness about two-fifths of the width.

CHAPTER III.

SCRAPERS. PL. 3.

We must not suppose that primitive utensils were restricted to special uses, like the varied contents of a modern workshop, a primitive axe being at hand to do duty for a hoe, a net-sinker to act as a hammer—* yet knowing the habits of modern savages, and judging the capabilities of an implement, we will seldom fail in assigning it to its proper use. While many knives and scrapers may be used indifferently, in most cases we may be allowed to separate them—hence the present section.

Figs. 1, 2, represent what I suppose to be natural spalls of quartzite, of which sharp fragments were always procurable at this locality.

Figs. 5, 6, of indurite, with little or no work after being severed: both marked with yellow clay.

Figs. 4, 16, white quartz, the latter one from the black mold. The edge of No. 4 is thin and sharp, it includes the rounded extremity, about half the convex and one-third of the concave margin.

Fig. 10, thick at base, thinner towards the point, chipped from a black chert pebble.

Figs. 11, 15 (both from the black mold), and 19 are of hard cherty stone. In No. 11, the convexity of the edge is slight, in others much greater.

Figs. 3, 7, 8, 12, 13, 14, red jasper of various tints. A remarkably large bur ("bulb of percussion") appears on No. 3, which has a perforation due to a drusy cavity.

Fig. 7, a beautiful, bright, polished, red flake, beveled by chipping along the right margin: a less abrupt bevel on the narrow part of the left side: inferior or flat surface slightly concave. Compare Reliq. Aquitanicæ, A, Pl. X, Fig. 5; and Evans (Stone Implements, Fig. 397), who remarks that, "Such scrapers also occur in most of the caves which have furnished implements in France and Belgium, and usually in much greater proportional abundance than has been the case in Kent's Cavern.

* "I admired the cleanness and flatness of all their yards. The ground is first covered with a soft wrought clay, and smoothed by rolling hard clay vessels over it."—Rev. John Campbell. Travels in South Africa, vol. 1, p. 244, 1822.

* * * * They appear to me to have served for other purposes besides that of dressing skins—one of the uses to which such instruments are applied by the Esquimaux of the present day." p. 455.

Fig. 8, reddish-brown, jasper flake; flat surface (upon which it probably reposed) retaining some of the natural polish of the fresh fracture, which is scarcely present on the upper side. Probably from the yellow clay.

Fig. 9, yellow jasper retaining polish; chipped on both sides: apex adapted for boring: lateral notch seemingly for scraping sinews, intestines, and arrow-shafts. (See my "Gleanings," in Peet's Am. Antiquarian, July, 1878, p. 81, and Reliq. Aquitanicæ, A. Pl. 35, Fig. 4.) Found June 1, 1876.

Figs. 11–15, all show marks of chipping; 14 probably required a handle, it resembles an arrow, blunt arrows having been in use. (Am. Antiquarian, 1878, p. 79.) Fig. 11 has one edge beveled by chipping; from the black mold.

Jasper occurs sparsely among the pebbles of the Susquehanna, and seems to have been selected as much for its beauty as for its utility.

Figs. 17, 18, chipped from small black flints of which part of the original surfaces remain. They bear some resemblance to gun-flints.

Fig. 21, represents one of the best finished objects found. It is of gray chalcedony, and might be regarded as a gun-flint, such flints being sometimes found at localities occupied by the former natives. The present object is neatly chipped into convexity on both surfaces, but not the short truncate base; the margins have cutting edges, that in front being concave and adapted for scraping objects like arrow-shafts.

Fig. 20, a thin piece of gray shale, the edge of the wider portion retaining the general thickness, and polished as if by scraping a concave surface—hence judged to be a pot-scraper. Another example occurred which resembles the wider half of this one.

Fig. 22, pale chalcedony with a rose tint: well finished, base abruptly chipped; inferior surface flat; scraping edge straight. See Rau, Archæological Collection of the U. S. National Museum, 1876, Fig. 38.

Fig. 23, impure limestone; probably combining the functions of arrow-scraper, borer, and small fish-spear.

Fig. 24, apparently quartzose limestone: chipping coarse: thickness nearly one-fifth of the length.

The Retreat has not afforded specimens of scrapers formed of broken arrow-heads by adding a new edge, although they occur in the vicinity.*

*Mr. Amos H. Gottschall has sent me a Dakota scraper he found in use (April, 1878) for removing fat and flesh from hides; it is a semi circular stone flake about $1\frac{3}{4}$ inch long and $2\frac{1}{4}$ wide, resembling the base of Dr. Abbott's Smithsonian Figure 38, but the surface and edge worn smooth. The skin to be cleaned is spread and fastened between two

CHAPTER IV.

BORERS. PL. 4.

Some of the specimens here figured as borers (as Fig. 1–9) may be regarded as equally representative of primitive arrow points, before these took regular forms.* (Compare C. C. Jones, Pl. 9, Figs. 31, 32.)

Of the borers represented, Figures 1–5, 12–15, 20, 24–26, are of white quartz (12, 14, 20, are marked with the black mold); 6, 11, 17, 18, 19, 21, 32, are quartzite of the locality, some of each material being mere spalls, but the points of 11, 14, 17, 18, 21, show marks of sharpening or use. Compare Reliquiæ Aquitanicæ, of Lartet and Christy, Figs. 23, 52, 55, 56, and A Pl. II. 1875.

Fig. 7, yellow jasper; 8, black chert; 9 pale argillaceous chert.

Fig. 10, indurite, with the surface soft from decay: probably from the lower or yellow clay stratum.

Fig. 16, a spall of red sandstone, but with an artificial notch on the right side.

Forms like Figs. 11, 12, 31, 32 (without a broad base), were probably provided with a handle of bone or wood. (Compare Sven Nilsson, Habitants primitifs de la Scandinavie, Pl. 2, Fig. 25.) Akin to these are the neatly chipped specimens, Figs. 22, 23, 27, of which Fig. 22 represents a common form, inasmuch as it is a fragment without a base—a part inferrible from that of Fig. 23, which has a sharp chisel-shaped edge—or from Fig. 30, which has an edge dulled by decay, and basal projections. A second specimen like Fig. 23 was found.

In Figures 13, 14, 15, 17, 19, the base has been left more or less wide for easy manipulation.

In Figs. 18 and 21, a short point is suddenly contracted from a wide base, left in its rough condition as a handle. (Compare Evans, Stone Implements, Figs. 227, 229; Jones, Pl. 16, Fig. 5.)

The white quartz specimens, Figs. 20, 24, 25, 26, and the slaty examples, Figs. 30, 33, 34, have the base more or less widened on one or both sides, as if to form a handle. (Compare C. C. Abbott, Smithson. Report for 1875, Figs. 142, 143, 149–153; and Evans, Stone Implements, Fig. 230.)

Fig. 28, has two lateral and tapering projections near the base, perhaps intended for additional borers. (Compare Jones, Pl. 9, Figs. 11, 12; and Pl. 16, Fig. 4.)

upright poles sunk in the ground, and having a cross-pole above. The Rev John Campbell (Travels in South Africa, 2, 72), saw natives making various kinds of skin thin for cloaks, by scraping them with a small iron adze. Heckewelder (Indian Nations, 1876, p. 202), says hair was removed with the ribs of deer, &c. "Even now, they say that they can clean a skin as well with a well prepared rib-bone as with a knife."

*Some of these could be used in tattooing, for which, according to Heckewelder (p. 206), "sharp flint stones" or "sharp teeth of a fish" (perhaps the pike or the lucioperca) were used.

Fig. 29, I take to represent a borer, probably intended to be inserted in a handle. (See Abbott, Fig. 145.)

Figs. 35, 36, represent flattened awls, both sharply pointed when found, the blunt extremity polished, apparently by being held between the fingers in some such use as sewing.

Figs. 37–40, awls of bone, of which Fig. 40 shows scratches of the implement used in shaping it.

CHAPTER V.

ARROW-HEADS. PL. 5, 6.

Arrow-heads seem, upon both continents, to be the most common of all definite stone implements. The Chickis Retreat furnished about four hundred entire or fragmentary examples, excluding mere spalls and counting the many worked fragments which belong to this type.

The material used includes quartzite (Pl. 5, Fig. 15, 16; Pl. 6, Fig. 31), and white quartz (Pl. 5, Figs. 17, 18, 21; Pl. 6, Figs. 1, 2, 7, 8, 16, 18, 20, 21), both minerals of the locality; limestone of the vicinity (rarely used); and minerals selected from the pebbles and fragments along the shore and bed of the Susquehanna, such as red jasper (Pl. 6, Fig. 10), yellow jasper (Pl. 6, Fig. 22), chert, trap, indurite (indurated clay); and siliceous shale (Pl. 5, Fig. 22, 23, 25, 26; Pl. 6, Fig. 13, 23, 29, 32), hard enough to scratch glass.

The numerous broken specimens and the abundance of chips, suggest that the retreat was occupied by generations of arrow-makers; and it might be expected that four hundred specimens from the same work-shop, would exhibit many stages of the manufacture, and Plate 5 represents such an illustrative series. A pebble having been selected, and perhaps tried as to texture by detaching a chip, as in Pl. 5, Fig. 1, the next step is to break it in two, as in Fig. 1 and 2, of which the opposite half was possibly used, as the surface seems to present a favorable texture, particularly that of Fig. 2, which retains the fractural gloss, and the edge of both is sufficiently sharp to allow them to be used as scrapers. In Fig. 3 and 4, part of the unwrought surface of the stone or pebble remains, and a slight advance is made towards the final arrow form, an advance which appears in most of the figures. Fig. 5 may be a mere chip whose irregularity of fracture would have caused its rejection.

Figs. 11 and 14, may have been intended for borers.

Fig. 12, may represent the head of a fish-spear: with a good outline, the form is thick, and the work coarse.

Fig. 13, represents a flake of hard reddish-brown indurite, with a pale brown, decayed exterior, and harder resisting points projecting on the inferior flat surface: upper surface with the two rectilinear margins beveled, apparently by rubbing, but the lines marking the limits of the beveling are obsolete from decay: base broken. An interesting specimen.

Figures 15 and 16, represent quartzite points judged to be of great age from the dull surface and weather-beaten aspect in so hard a mineral.

Most of the specimens here figured indicate that the point was the first part finished; and in the quartz example Fig. 21, and siliceous shale, Fig. 22, an unremoved mass of the material remains at the base. Figures 24 and 25 indicate that the basal notches were the last parts made.

The form of Fig. 25 is unusual, but it occurs in Pennsylvania. Dr. Rau (Archæol. Coll. 1876, Fig. 47), figures a specimen from Georgia.

ARROW-HEADS. PL. 6.

Figures 1, 2, 7, 8, 16, 18, 20, 21, white quartz, all seemingly from the black mold except the leaf-shaped, Fig. 16, with which compare Jones, Pl. 9, Fig. 3; Abbott, Fig. 101; Rau, Fig. 4.

Fig. 2, has a good outline, but each surface has a rough medial projection indicating an unfinished condition: the surface has lost most of the fractural gloss.

Figs. 3, 17, chert or black flint: glossy and neatly finished. Compare Abbott, 1875–6, Fig. 83; Jones, Pl. 9, Fig. 26; Rau, Fig. 6.

Fig. 4, chert: marked "Chickis? recess, March 26, 1877." I have several New Jersey specimens of this form from Mr. Wm. Klingbeil. Rare in Pennsylvania; less rare in Georgia, whence I have examples from my friend Dr. J. L. LeConte, of various sizes (some more slender), with the base more deeply emarginate than in Fig. 4.

Figs. 5 and 6, chipped from hard gray quartzose material: fracture glossy. See Abbott, Fig. 82.

Fig. 9, pale bluish-gray chalcedony. Arrow-heads of this material occur rarely in the vicinal fields, also in the next County of Chester, and in East Tennessee.

Fig. 10, dark-red chipped jasper with a fresh surface: a handsome specimen found in the earlier period of the excavation—probably about ten inches from the surface.

Fig. 11, edges serrulate; material cherty, surface dull.

Figs. 12 and 23, have the lozenge shape, which is rather rare in the vicinity. Compare Evans, Stone Implements, Figs. 296-7.

Fig. 14, bluish, resembling a cherty, shaly limestone: scarcely hard enough to

scratch glass. Rudely made by the removal of flakes, as in the hard shale specimen, Fig. 29.

Figs. 11, 12, 13, 25, 26, 32, are of a black cherty material without gloss.

Fig. 19, light brown jasper; neatly chipped; unsymmetric.

Fig. 20, base bifurcate, adapting it to a corresponding part in the terminal notch of the shaft, to prevent lateral motion, as shown in recent stone-tipped arrows from Utah. Form widely spread, but not common.

Fig. 22, a delicate thin specimen of yellow jasper; the slight gloss upon one surface is due to brushing. Found March 6, 1876. I have the form from New Jersey, East Tennessee and Texas, from the size of a small arrow-head (about $1\frac{1}{2}$ inch long, $\frac{3}{8}$ wide, sides sub-parallel), to that of a spear-head.

Figs. 24 (blackish), 33 (black), 34 (yellowish), apparently of indurite, have the appearance of great age; surface of 24, 34, much corroded.

Figs. 25, 26, 27, 32, cherty, without lustre: 26 is obtuse-angled, the sides being unequal—a form of which white quartz examples occur in the next County, Chester.

Fig. 28, a broken specimen, pale bluish, resembling cherty limestone; shape of the base unusual.

Fig. 30, of black gritty stone: old and irregular.

Fig. 31, quartzite of the locality, of two colors, pale gray and pale ferruginous: presumed to be old.

Fig. 35, represents a thin regular metallic arrow-head of a coppery appearance, but yellow on a new surface, and presumed to be European brass, therefore within the historic period, with brass dishes occurring in graves. It was found outside of the retreat.

CHAPTER VI.

SPEAR-HEADS. PL. 7.

Except in size, there is little difference between spear-heads and arrow-heads; and there is probably no difference between the heads of spears, whether used for thrusting or for throwing.* Certain broad, triangular forms (as Figs. 11, 12), seem intended for fish-spears, the barbs being sufficiently broad to hold in the soft muscle of fishes.

Of the specimens illustrated, Figs. 1, 2, 4, 5, 7, 11, show marks of age and decay.

*Dr. Abbott distinguishes between a lance and a spear, assigning to the spear-head "a notched or stemmed base, or both, which features singularly or together characterize the spear-head proper, which, also, are smaller as a class than lance-heads, but too large to be of use if placed at the end of an arrow."—Stone Age of New Jersey, Smithsonian Report for 1875, p. 269.

Figs. 1, 4, indurite; surface pale greenish, with hard projections left by decay; a chip from No. 4, shows a black interior. When entire, the length of this specimen may have been about five inches.

Figs. 3, 9, 13, resemble cherty limestone, but do not effervesce with acid: No. 9 and 13 are pale bluish, No. 13 darker.

Fig. 5, dark indurite, gritty from decay and having several projecting nodules, like No. 1 and 4: surface greatly decayed.

Fig. 6, a pale brown grit; robust, chipped coarsely but with skill; lines of fracture distinct, a sharp medial ridge on the inferior surface, extending about three inches from the point: length 4, greatest thickness $\frac{5}{8}$ inch.

In Fig. 7. the surface is like that of No. 5: robust; length 4, breadth $1\frac{1}{2}$, greatest thickness $\frac{7}{8}$ inch, due to a bulge on the upper surface.

Fig. 8, material cherty, black, without gloss (resembling Figs. 11, &c. of Pl. 6): edges finely chipped and somewhat serrulate towards the apex: ridges or fracture distinct: length 4 3-16, greatest thickness $\frac{3}{8}$ inch. A second example was found.

Fig. 9, thin and delicate, inferior surface flat, upper surface shaped with a few flat chips: length $3\frac{3}{4}$, greatest thickness less than $\frac{3}{8}$ inch, due to a bulge near the base.

Fig. 10, a black glossy chert or flint, but less glossy than Figs. 3 and 17 of Pl. 6: both sides neatly worked; ridges of fracture low but distinct: length $2\frac{7}{8}$, greatest thickness $\frac{1}{4}$ inch. A well finished and rare specimen, one of the finest found, which might, perhaps, be classed with arrow-heads. I have seen a specimen very like it, found in Ohio.

Fig. 11, pale bluish, surface roughened and lines of fracture lost by decay.

Fig. 12, a coarse specimen of rough grit; old, but lines of fracture apparent.

Fig. 13, represents the apical portion of a broken lance-head somewhat resembling No. 7, but of a kind wider and flatter, leaf-shaped or oval, with a rounded base, of which Dr. Abbott's Fig. 38 (1875) is an average form on the Susquehanna, and of which the Retreat furnishes a fragment (rather more than the basal half) which scarcely differs from the corresponding part of Abbott's figure. Its material is that of Figs. 3 and 9; its greatest thickness about $\frac{3}{4}$ inch.

CHAPTER VII.

HOES AND DIGGERS. PL. 8, 9.

As the arrow-head passes into that of the spear, so when the form classed with spear-heads is regarded as too large for this weapon, its function is, with probable reason, considered to be that of a hoe. But the Retreat has not yielded an example of the lance-head form (such as Abbott's Fig. 37), large enough to be classed as a hoe, although the form occurs in the vicinity, and on the Forge islands seven miles above. A specimen was found about 170 yards north of the Retreat.

Fig. 1 (Pl. 8) is adapted for digging, and may be termed a hoe: it is formed of a gritty flat river stone; upper and lower surfaces nearly parallel; left margin flat and vertical; right margin coarsely chipped to a medial edge; point similarly chipped: part of the base wanting; present length about $6\frac{3}{4}$, thickness $1\frac{1}{4}$ inch.

Fig. 2 (Pl. 8), a flat oval sandstone pebble; one edge broken as if for a handle; one end apparently broken by use; greatest thickness about $1\frac{1}{8}$ inch.

Fig. 3, described at the close of the chapter on hammers.

Pl. 9, Fig. 1, represents the only distinctly grooved implement found, a river pebble with an original thickness of about two inches: groove pecked in the upper surface, not reaching the margins: edge narrow and flat, formed by removing a few large chips from both surfaces: a very large spall has been split from the basal portion of the lower surface, leaving a plane about 4 inches long and 3 wide. The spall may have been split off intentionally for the purpose of adapting a handle at right angles to the cutting edge.

Pl. 9, Fig. 2, dolerite, rough and gritty from decay, exterior particles so slightly attached as to be removable in handling, showing the absence of abrasion during the period of decay in the soil of the Retreat. There is some appearance of a notch and groove, which point to a war club. Base $1\frac{3}{8}$, narrowing to $\frac{5}{8}$ inch thick at the opposite extremity; no edge remaining.

Pl. 9, Fig. 3, a quartzite digger, the handle trimmed and well adapted for holding: greatest thickness $1\frac{1}{4}$ inch. Probably intended for taking up roots.

CHAPTER VIII.

SINKERS. PL. 10.

It has been customary to regard certain notched stones as net-sinkers, and at the Centennial Exposition at Philadelphia in 1876, there was a wide-meshed seine (I believe from Northern America) made of narrow thongs, the lower edge of which was

weighted with such stones. Some of the larger examples of these stones may have been used as weights to the vines with which streams were swept to drive the fish into weirs, or as anchors to long lines (out-lines) set during the night, with attached shorter lines or links bearing the hooks.

Figures 1, 3, 5, represent rough specimens made of the quartzite of the locality.

Fig. 1, is distinctly notched upon one margin, the other being nearly in its natural condition: margins with a sharpness seemingly due to natural fracture, except that which forms the top of the figure, which has the appearance of being artificially rounded and provided with the cutting edge of an axe, of which it may be a rude specimen. Thickness $1\frac{1}{8}$ inch.

Fig. 2, a river pebble with a rough notch on each lateral margin: thickness $1\frac{3}{4}$ inch: might pass for a hammer: found January 17, 1876.

Fig. 3, a single notch broken from the thin edge of a natural fragment.

Fig. 4, flat, gritty slate; the commoner form in New Jersey and Pennsylvania, —rare in the vicinity. The specimen occurred in digging outside of the Retreat, May 26, 1876. Compare Abbott, Fig. 204; C. C. Jones, Pl. 19, Fig. 11; Rau, Arch. Coll. Fig. 112.

Figs. 5-9, probably fishing-line sinkers, of which 6, 7, 9, are made of river pebbles.

CHAPTER IX.

HAMMER-STONES. PL. 11.

The Retreat furnished about fifty stones, mostly river pebbles, varying in form and size, some marked, others unmarked, the latter of which, if found with river gravel, would not be entitled to mention here, but being placed by human hands in a human habitation, they are to be classified as implements. All of the specimens figured except Fig. 2, are of sandstone, and all have marks of adaptation or use.

Fig. 1, was probably at first intended for something like the chungkee stone of the Cherokees and other tribes, and afterwards broken in being used as a hammer: both faces have the central depression for the thumb and middle finger: the edges of the cavities left by the removal of several marginal chips above, have lost their sharpness and the depressions have the dullness of the general surface, but a later chip from the lower surface exposes a fresher fracture with a well-defined margin. Brown sandstone: greatest thickness $1\frac{3}{4}$ inch.

Fig. 2, resembling a fine-grained graywack; much decayed: apparently from the yellow clay.

Fig. 3, a brown ferruginous sandstone pebble: upper, or less convex surface, with a slight depression formed by pecking: lower end broken, lines of fracture sharp.

Fig. 4, a pecked spot on the upper surface: marks of usage at three or four points of the margin: a chip removed from below, leaving a sharp margin: greatest thickness about $1\frac{7}{8}$ inch.

Fig. 5, subtriangular, with marks of usage: a single, coarsely made, medial depression: greatest thickness $1\frac{1}{2}$ inch. Compare Abbott's figure 217.

Fig. 6, an irregular ball, each extremity slightly roughened as if by pecking, or by use as a hammer. Balls of stone occur in the vicinity, and among the Western and Southern Indians. A sandstone specimen from a field in the vicinity of the Retreat, is about $2\frac{7}{8}$ inch in diameter, and another of quartz is about 3 inches; a third from the Forge islands seven miles north, of a siliceous material, measures $2\frac{1}{4}$ inches, and is the most regular of these. More nearly spherical is a small one ($1\frac{5}{8}$ inch) from East Tennessee, sent to me by Mr. F. A. Stratton. Probably from the absence of better material, balls of burnt clay were made in Florida, of which I have fragments indicating a diameter of about two inches.

Pl. 8, Fig. 3, represents a brown sandstone muller or paint grinder, as shown by the red material in crevices at the base.

The Retreat furnished no pestles, but a neatly finished brown sandstone example was found about 170 yards north of it; length $10\frac{5}{8}$, diameter $1\frac{7}{8}$ inch.

CHAPTER X.

I. TOMAHAWKS OF HONOR. PL. 12, FIGS. 1-4.

Parts of five examples of these light, perforated tomahawks (banner-stones, sceptres, or badges of authority) were found in the Retreat (Figs. 1–4), of which two of the halves (Fig. 4) belonged to one implement.

Fig. 1, siliceous slate with minute micaceous specks: hard enough to scratch glass: surface retaining some polish: ridges of fracture sharp: a small biconic perforation countersunk from each side. It retains some of the yellow clay in which it was buried, its position having been pointed out to me by the boy who found it, February 19, 1876, and unless his account was false, this is one of the oldest objects found. What is left of the perforation for the handle, has the striæ marking the boring, and some gritty projecting particles.

Fig. 2, material a yellowish steatite.

Fig. 3, of black slate: a doubly countersunk perforation from face to face (as in No. 1), through the thickest part of the fragment. These perforations are rather common, and seem adapted for dressing bow-strings.

Fig. 4, of black slate: the medial part is flat and angular on the side figured, and curved on the other: the margin of the right wing has one notch above and two below, the left wing three above—probably mnemonic. The half of a nearly similar specimen was present.

These implements usually occur broken at the eye, where the material is thin. The breakage may be due to a tightly fitting handle, to wedging a loose one, to its expansion from moisture, or to the fact that in some cases the perforation was made after the completion of the exterior.

II. PIPES. PL. 12, FIGS. 5–6.

Fig. 5, represents a taper steatite pipe, flat below and convex above: bore mostly uniform, but funnel-shaped at the larger extremity, and about as wide as the dimensions admit: a V-shaped excision at the larger end of the flat surface, and a fragment broken from the end of the convex surface. Resembles a modern cigar-holder, and is judged to be a smoking pipe, of which the figure probably represents about the original size.

Fig. 6, part of a pipestem of clay, slightly burnt: from the upper part of the black mold.

III. CORES AND CHIPS. PL. 12, FIG. 7.

Fig. 7, represents a gray indurite, of which the fresh fracture is black, an object which may be termed a core, as it shows that several flakes or chips have been removed from it of the kind which furnish cutting edges.

As part of the business of the Retreat was making stone implements, particularly arrow-heads, an abundance of chips and spalls occurred, many of foreign material, and with delicate points and edges indicative of manufacture on the spot, and subsequent repose.

IV. PEBBLES. PL. 12, FIG. 8.

In Chapter V, allusion is made to trying the texture of pebbles selected for making arrow-heads, by striking off a chip, and such a one is represented in Fig. 8. The chips varied in size from one-fourth of an inch to half the pebble, and sometimes the marks of two or three appear: in most cases the line of fracture is sharp, but in a few the sharpness has disappeared. The size of the pebbles is from about $1\frac{1}{2}$ to 2 or $2\frac{1}{2}$ inches; the form approaches to oval or spheric, but is sometimes round and flat, adapted for throwing, and perhaps collected (together with the smaller hammer-

stones) for defence as well as for other purposes, but they did not occur in masses. Omitting doubtful specimens, the Retreat has furnished 455 of these pebbles, of which 160 are entire, the large number of 295 being chipped. Other chipped and unchipped examples, also some probable hammer-stones, borers, and scrapers, occurred from ten to thirty yards beyond the Retreat, and chiefly south of it.

Pebbles about half an inch in size (larger and smaller), perhaps collected for rattles, or due to ice; but river gravel does not appear in the soil, which has been recently (May, 1878), dug up for twelve yards in front of the Retreat to form a garden, the chief mineral present being small angular fragments of the quartzite of the vicinity, with an occasional entire or chipped pebble of the kind already mentioned.

A smooth flat river-stone, with vertical sides and rounded angles, occurred in the recess, and may have served for preparing food, for a baking-stone, or for a seat: 14½ inches long, 3 thick, 7½ to 8 wide.*

V. SHELLS. PL. 12, FIG. 9.

Several species of Unio inhabit the Susquehanna, and the shells occurred sparsely in the Retreat, mostly fragmentary and in a state of decay (as in Fig. 9, probably *U. radiatus*), but a more recent valve of *Unio complanatus* was found. The molluscs were probably eaten; the shells used for scrapers and tweezers;† and fine fragments are visible in the clay of some of the pottery found. Neither perforated specimens nor univalve species were observed.

VI. BONES. PL. 12, FIGS. 10–16.

Bones in various stages of decay or conservation were rather abundant; the hollow ones, such as Figs. 14, 15, are split, according to the habit of modern savages, who eat marrow.‡ Several of the specimens figured (Fig. 10–14) have been selected as probable awls, in addition to those of Plate 4. The originals of Figs. 13 and 14 are much decayed, and the latter is slightly notched on both sides, as if for the attachment of a string.

*I have from Mr. A. H. Gottschall a lenticular pebble, about 6½ inches across and 2¼ high, which he found in use by Sioux as a base upon which to pound flesh with a stone hammer.

†Heckewelder, Indian Nations, Hist. Soc. Penna., 1876, p. 205.

‡My friend, Prof. E. D. Cope, finds remains of the following species in the Retreat: *Cariacus virginianus* (common deer), bones abundant; *Sciurus hudsonius* (red squirrel); *Didelphys virginiana* (possum); Tortoise, species not determined; *Meleagris gallopavo* (turkey, a beak); and perhaps the domestic dog and sheep.

CHAPTER XI.

POTTERY. PL. 13, 14.

About 300 fragments of pottery were found within, or outside of the Retreat, and in some cases a piece apparently thrown out when a vessel was broken, could be fitted to another found inside; the finest example (Pl. 14, Fig. 9), was in four pieces, one from the inside and three from the earth outside.

The kinds are all more or less burnt; in some the burning from the inside is blackened for some depth, when the outside is reddish or yellowish, like a slightly burnt brick. Brown of various shades is a common color, and seems to belong to the more highly burnt, the thinnest, and most delicately made variety.

The material is clay alone, or clay mixed with finely broken mussel shells (Pl. 13, Fig. 1 and 21), or with grains of broken quartz (Pl. 14, Fig. 1).

In a few cases the exterior is smooth (Pl 13, Fig. 1), but the upper part of most of the vessels was marked with impressed lines and dots variously arranged for ornament, drawn before drying, apparently with the end of a small stick, quill, or bone; or impressed at right angles as with cords and knots (Pl. 14, Fig. 2), giving a netted appearance; also with a row or several rows left standing on an ear of maize (Pl. 14, Figs. 3, 4), or perhaps with the cob or spike. The inside of the margin or lip is rarely marked or ornamented (Pl. 14, Figs. 8*b*, 9*b*), and when the extreme edge is thick enough to admit of it (as in Pl. 13, Fig. 22, Pl. 14, Figs. 3, 4, 5, 7), this part may have ornamental impressions.

When a fragment wants the original margin, its upper part can be sometimes told by a curve indicating a widening towards the mouth, as in Pl. 13, Figs. 1, 3, 4, 5, 6, 8, 10, 11.

The margin is present in Figs. 9, 12, 13, 16, 19, 20, 22, of Pl. 13; and in 1, 2, 3, 4, 5, 7, 9, of Pl. 14. The presence of part of the margin shows the direction of the lines in Pl. 13, Fig. 20, but nothing remains to indicate that they were horizontal in the fragment Fig. 21.

The external impressions on the specimen Pl. 13, Fig. 12, resemble the row on the inside margin of Fig. 2*a*, Pl. 14.

The thickness of the pieces varies from $\frac{1}{8}$ to about $\frac{3}{8}$ of an inch: the somewhat irregular curve of a large fragment indicates a vessel 13 inches in diameter—a size which Pl. 14, Fig. 1, 2, 10, may have reached. Pl. 14, Fig. 6, represents a pot about 7 inches in diameter, and Pl. 14, Fig. 9, one of about $5\frac{1}{2}$ inches.

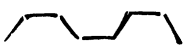
PLATE 14.

Figure 6, represents a piece of reddish, under-burnt pottery, with two perforations countersunk from the outside, and being intended for the reception of carrying-strings,

they are frequently or mostly placed at a different level, to divide the strain and prevent the separation of the rim—as shown in modern practice. In most cases they seem to be bored after the vessel has been burnt.

Figures 1, 7, 9, represent an uncommon style of ornament, consisting of a row of small cylindric holes near, and around the margin, pushed almost through the material, and appearing in elevations or pimples on the opposite side. In some vessels the holes are impressed from the inside (Fig. 1), in others (Figs. 7, 9) from the outside. In Fig. 5 the surface is ornamented with circular holes irregularly distributed.

The lip of Fig. 2*a* has the inside marked with a row of impressions: Fig. 8 is marked outside (*a*), and inside (*b*): the section of Fig. 9 appears at (*a*), and the inside of the lip is represented at (*b*.) The flat lip of Fig. 7 (*a*) is ornamented with a series of transverse lines resembling the impressions made with a string of several small beads, both string and beads being impressed. The surface ornaments have this bead character. The pattern is composed of a series of horizontal lines alternating with others at an angle of 45 degrees, disposed thus:

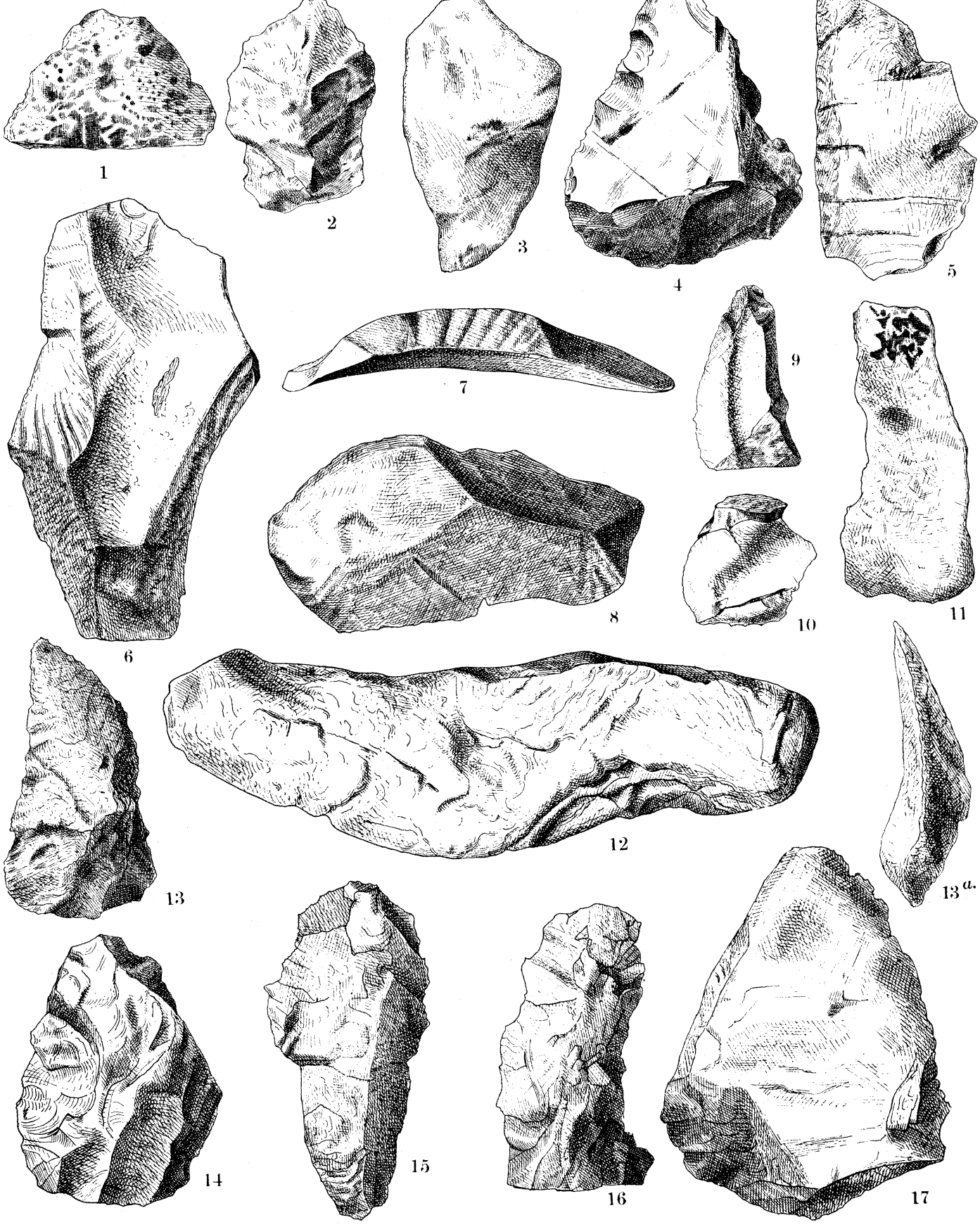


The lines of some specimens are zigzagged vertically, as in Pl. 14, Figs. 3, 4, 9; others horizontally, like the large one referred to as having had a diameter of about thirteen inches.

The Retreat furnished a single rough fragment of steatite pottery about four inches across and one inch thick—perhaps brought in its broken condition to cut into ornaments. About 175 yards north of the Retreat an old steatite dish was found, with a projecting ear at each end: length of the interior $4\frac{1}{2}$, breadth 4, depth $2\frac{1}{2}$ inches. Fragments and vessels of steatite are widely spread, occurring in California.

Besides the brass arrow-point mentioned (Pl. 6, Fig. 35), the connection with the historic period is marked by a leaden rifle bullet, and four glass beads found outside, three greenish, spheric and corroded, the other blue, cylindric and polished.

Some fragments of two kinds of mineral paint were present, one red, the other black.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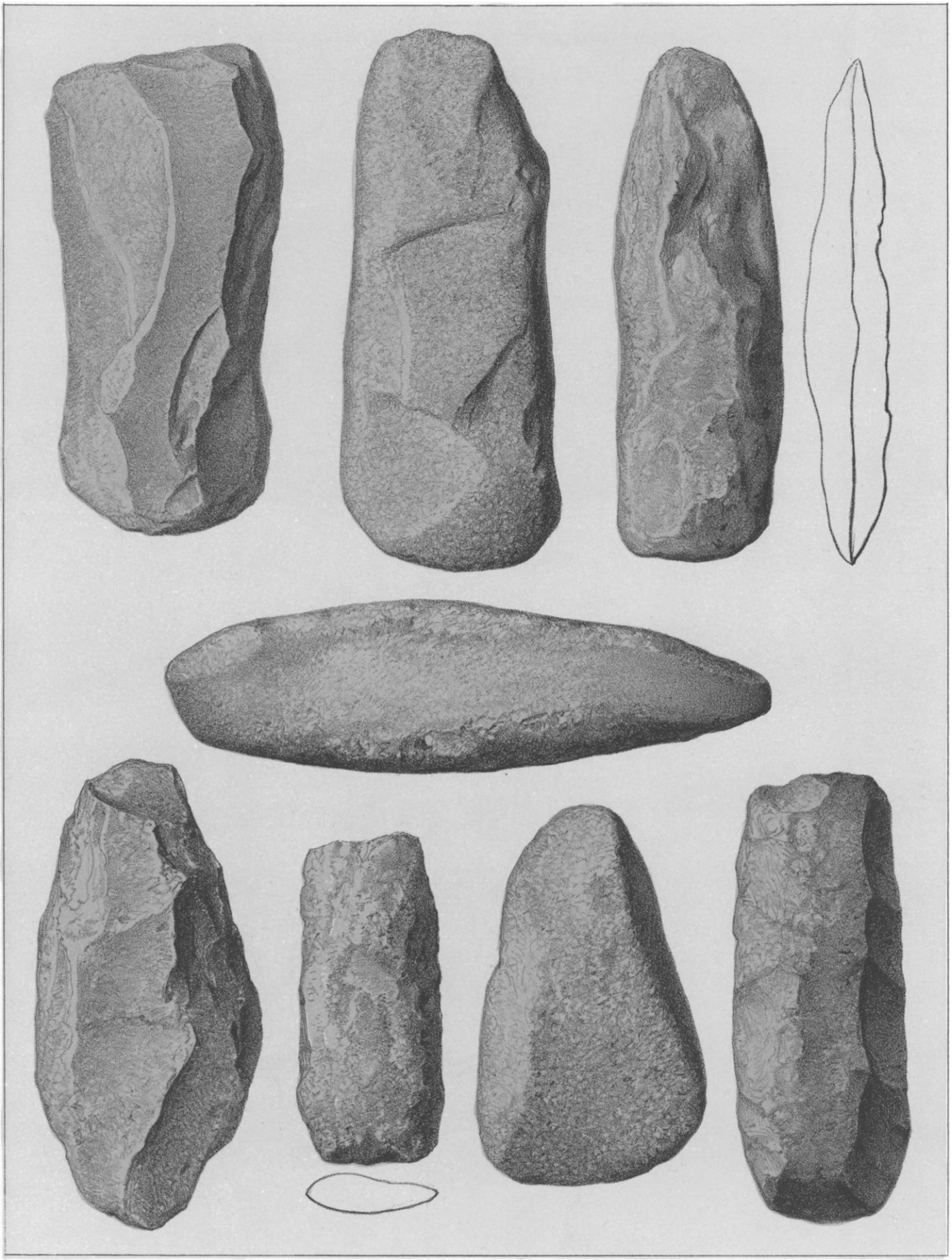

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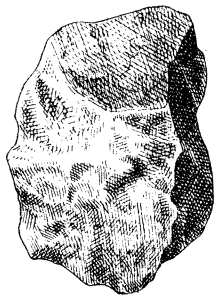
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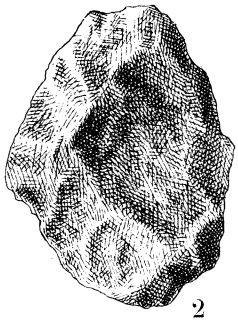
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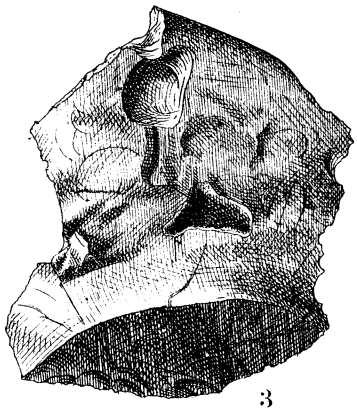
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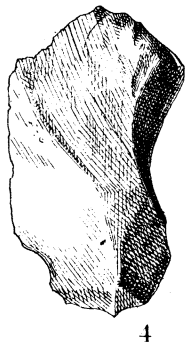
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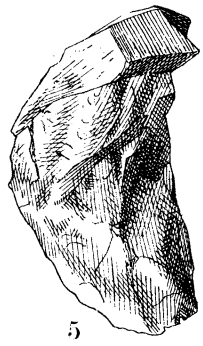
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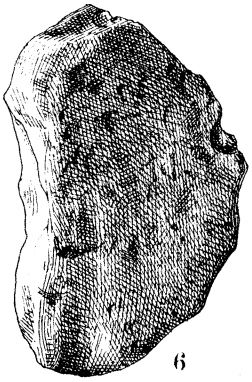
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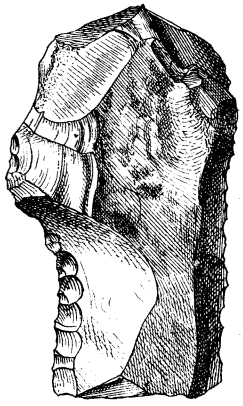
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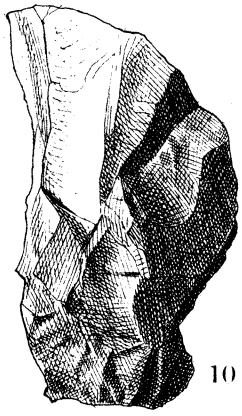
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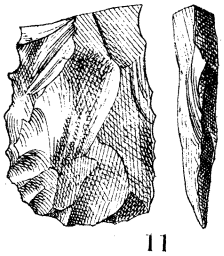
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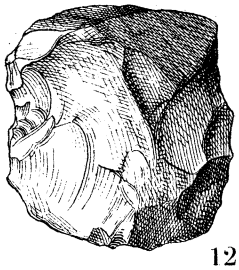
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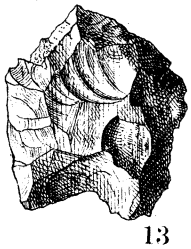
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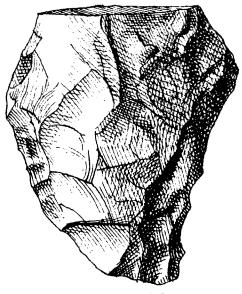
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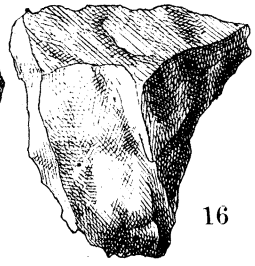
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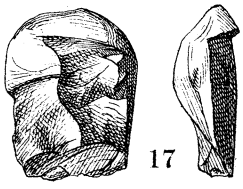
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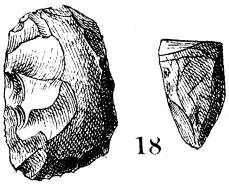
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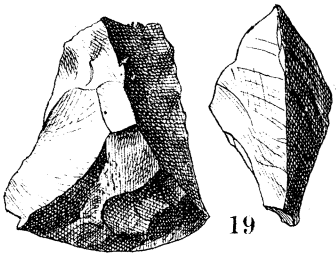
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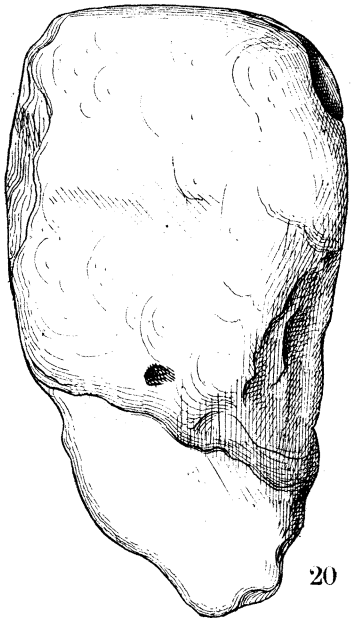
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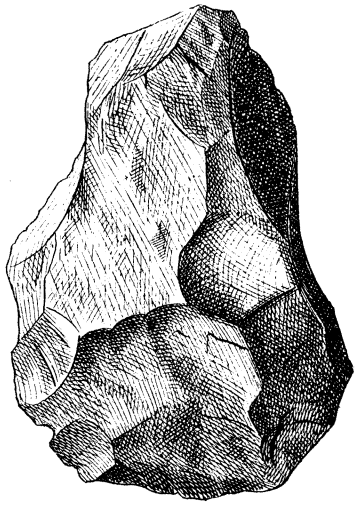
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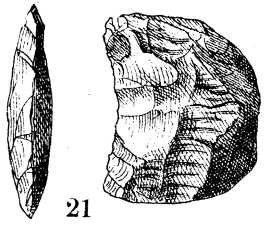
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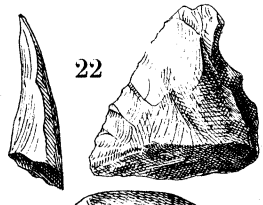
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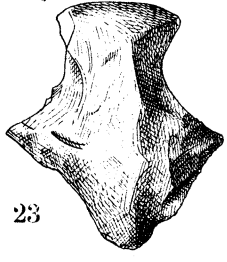
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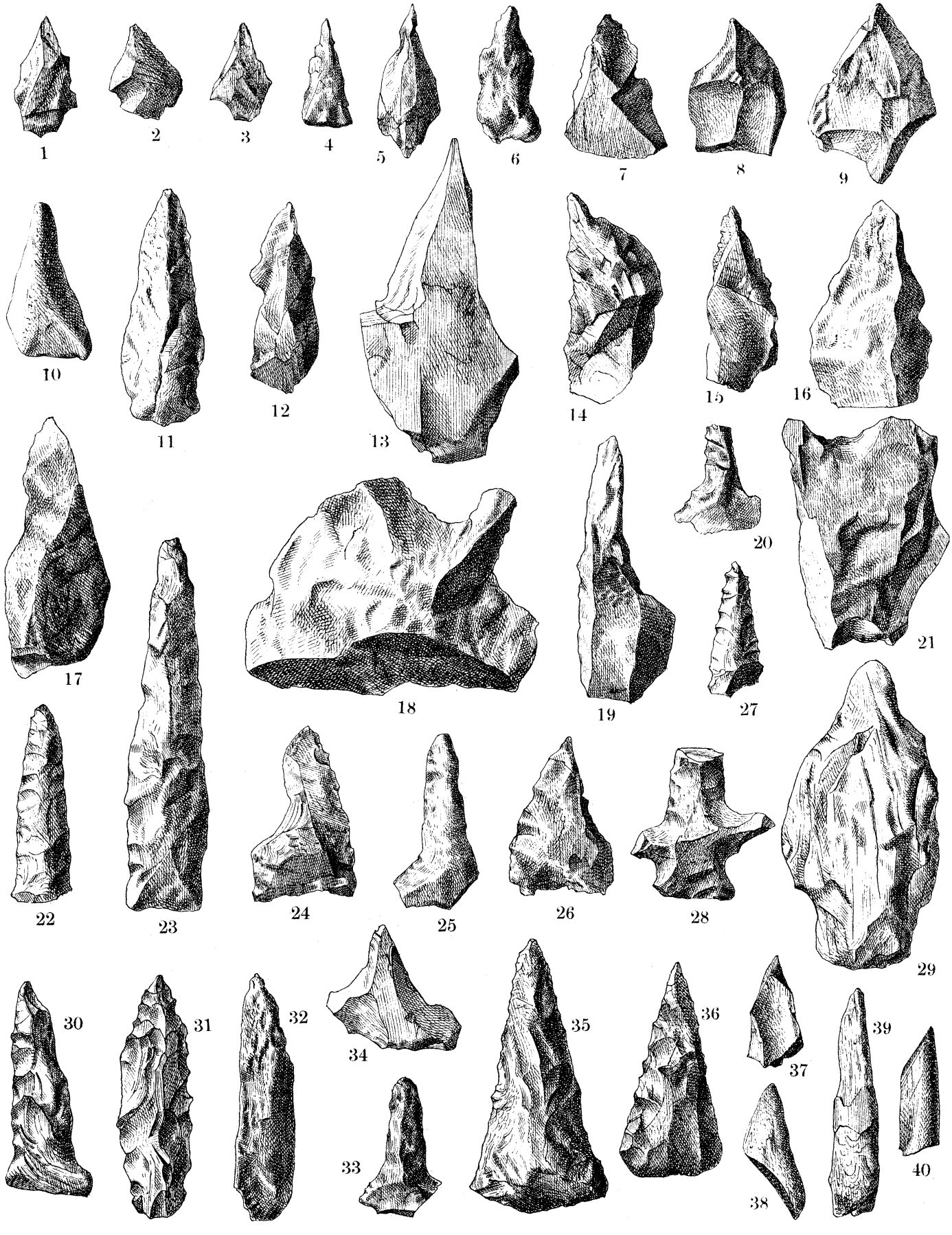
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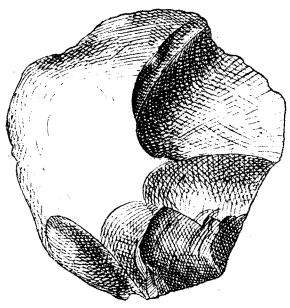
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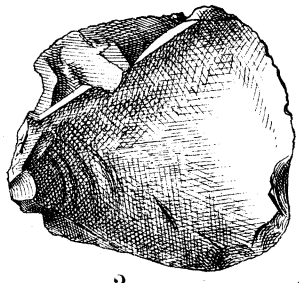
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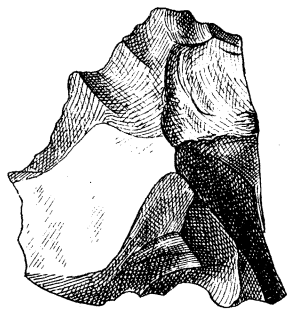
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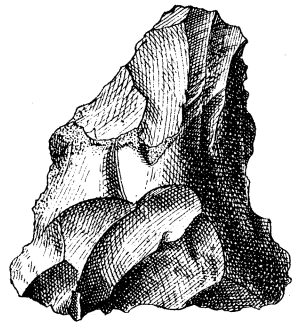
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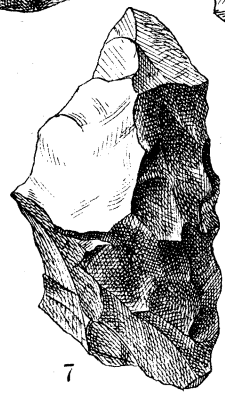
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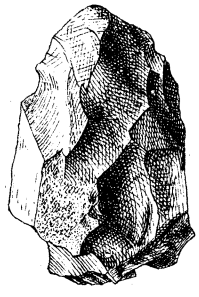
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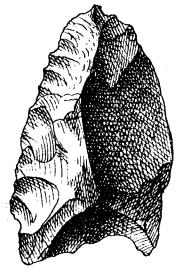
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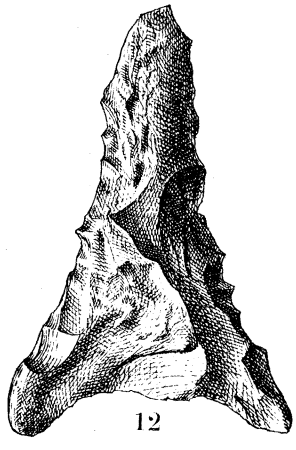
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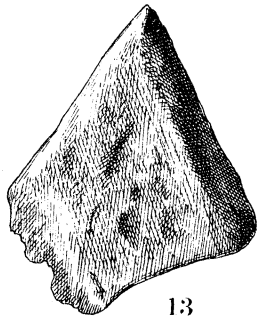
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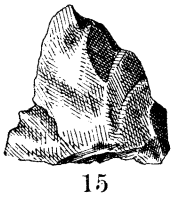
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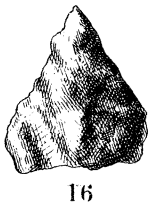
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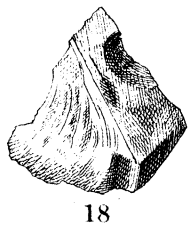
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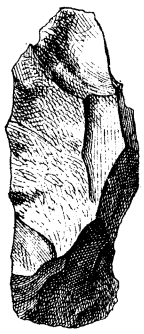
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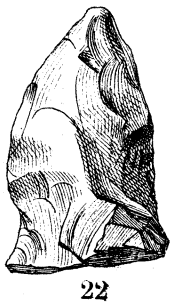
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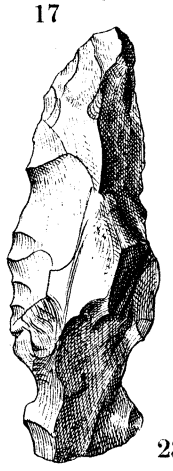
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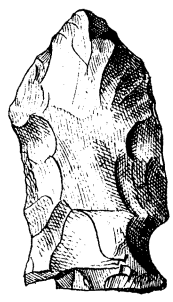
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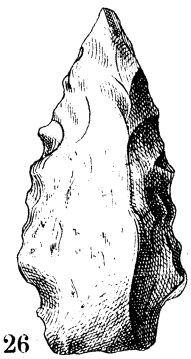
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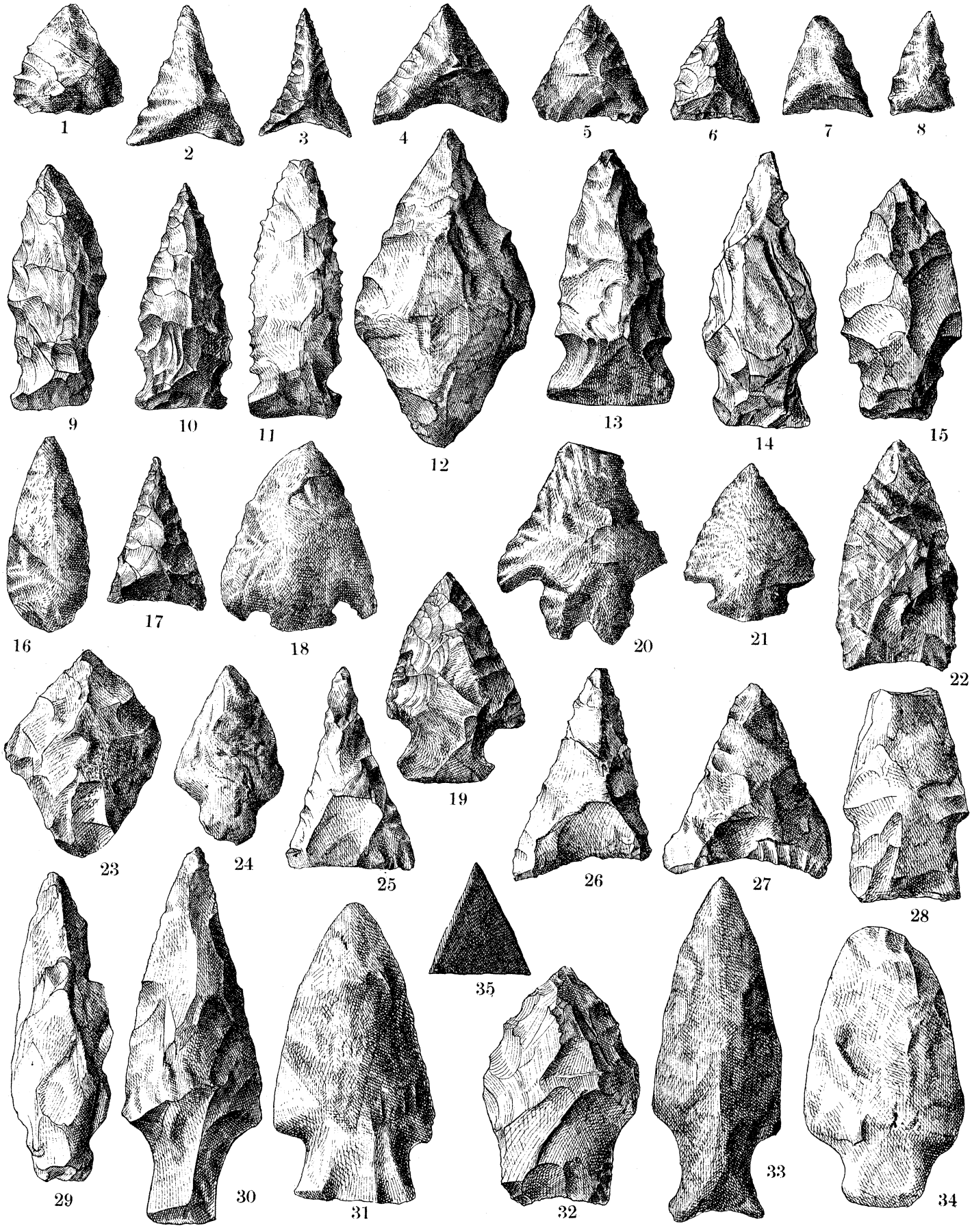
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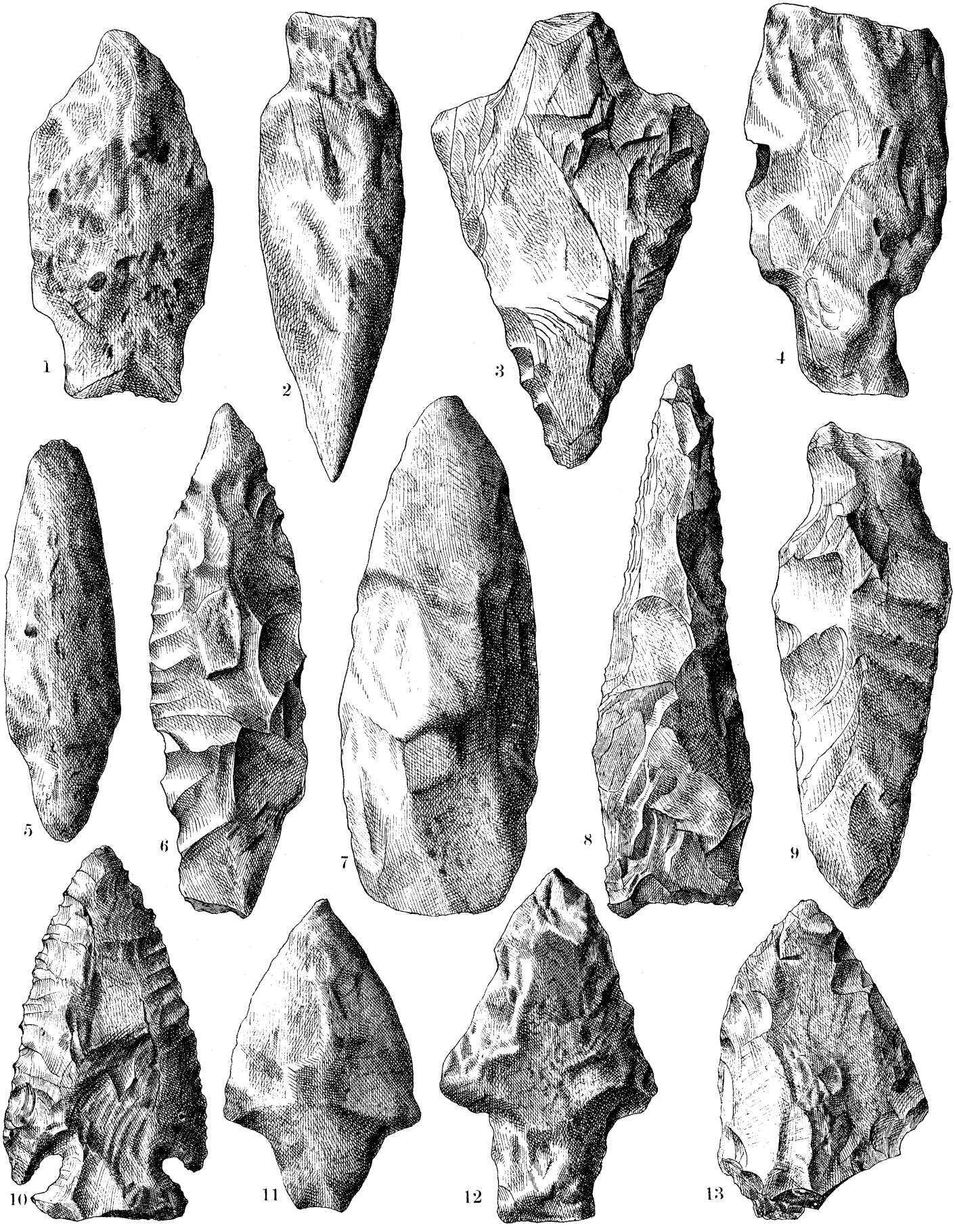
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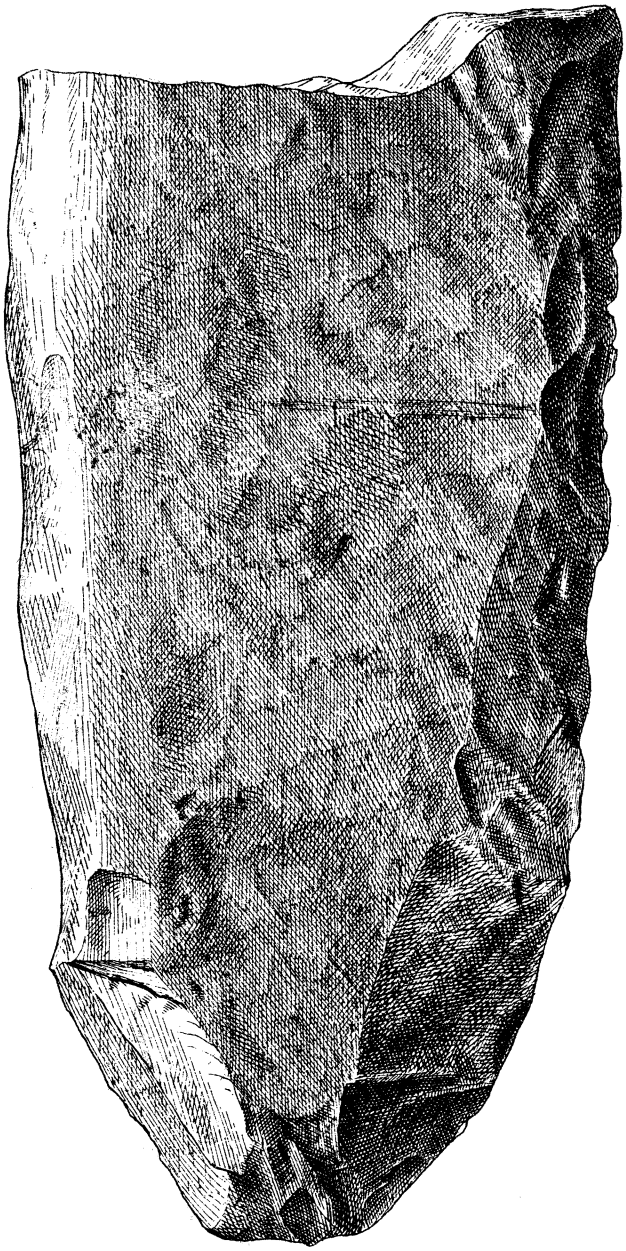

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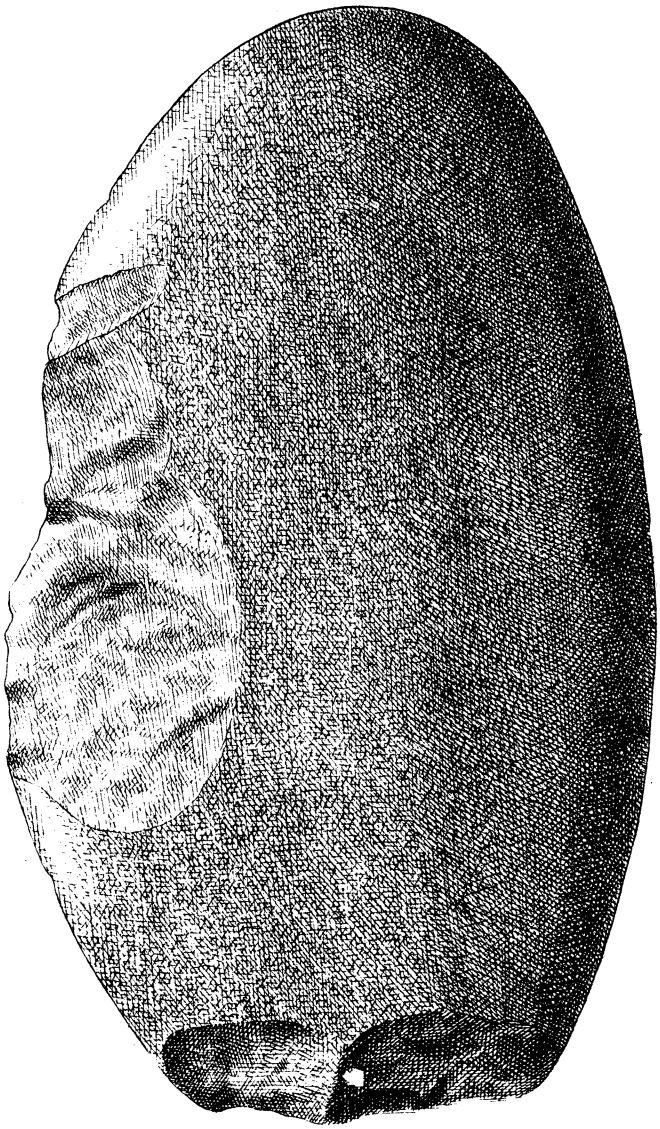

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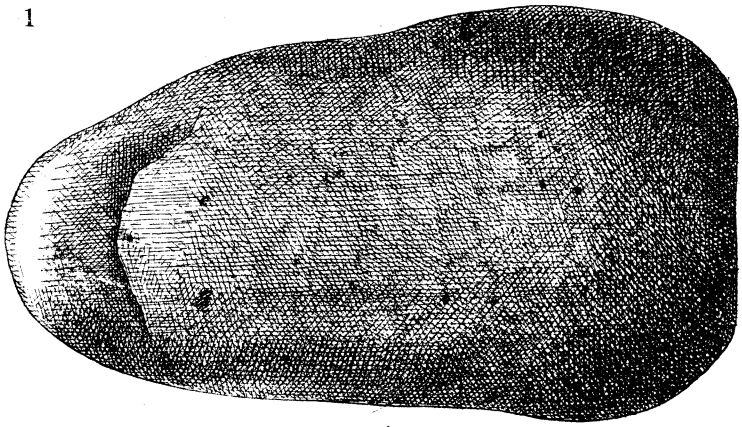

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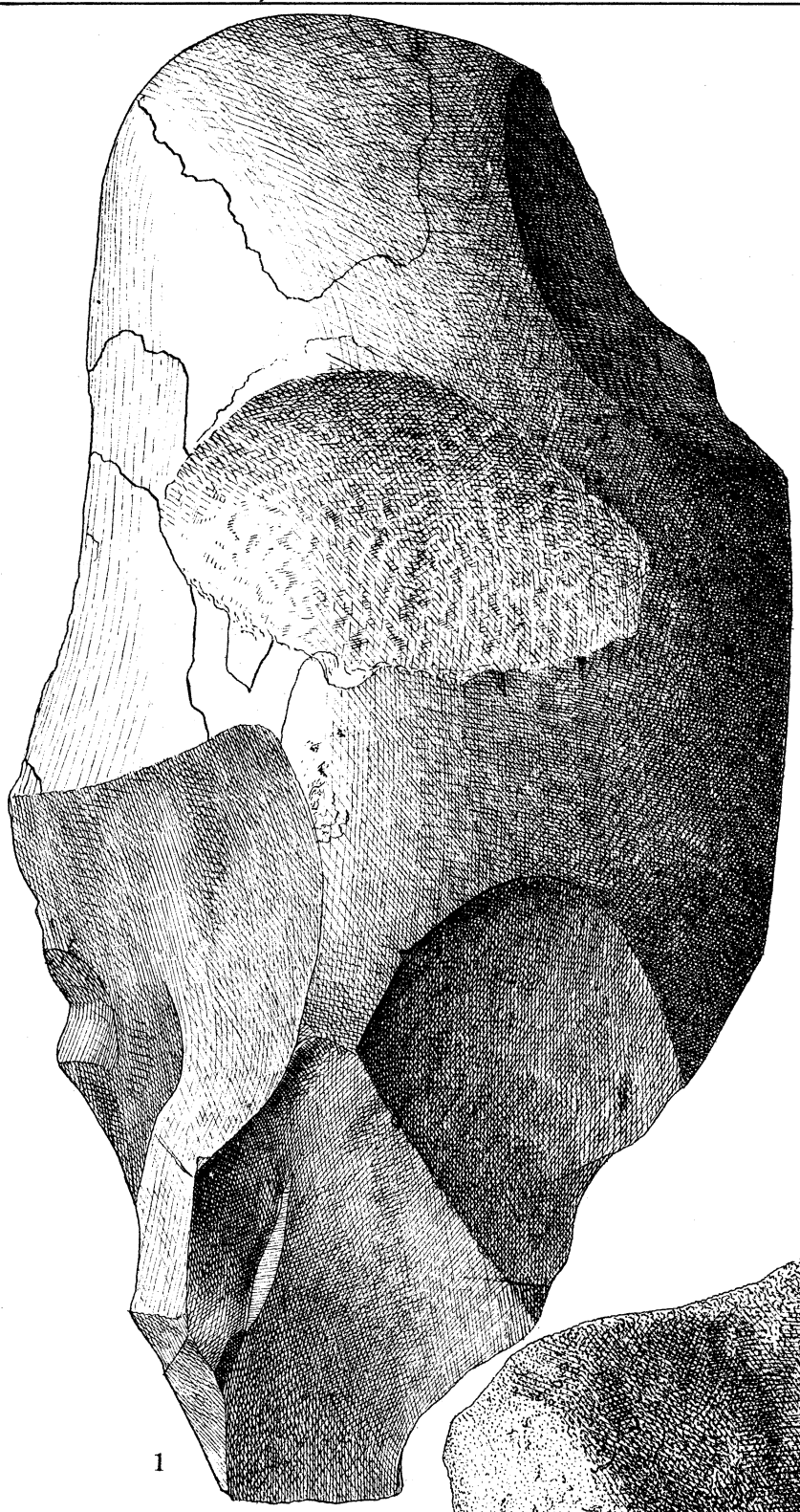

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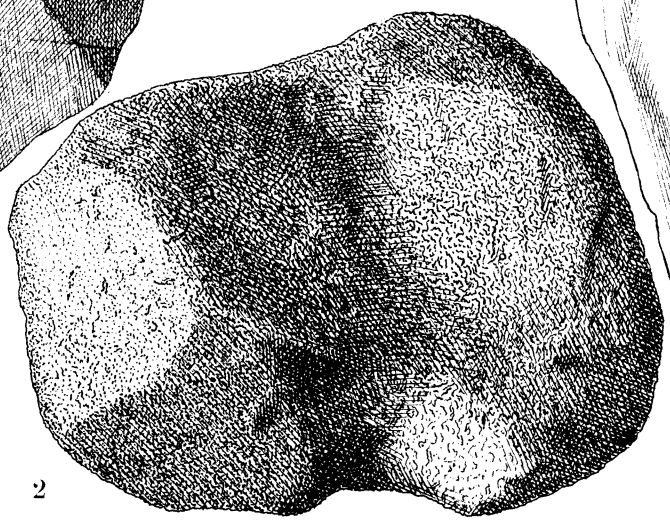

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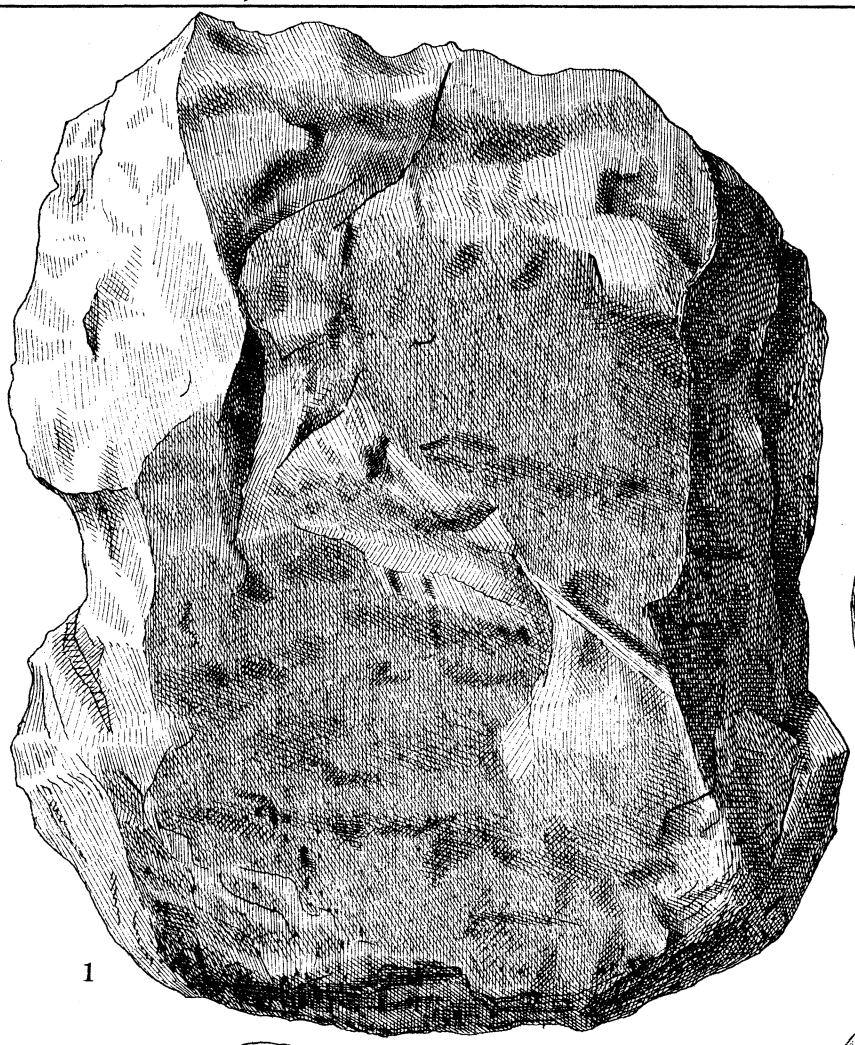

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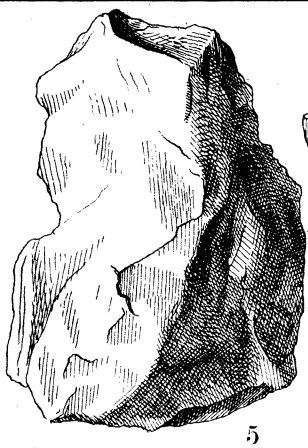

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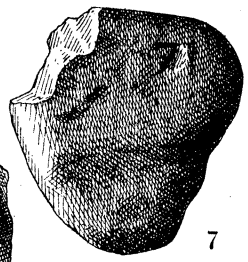

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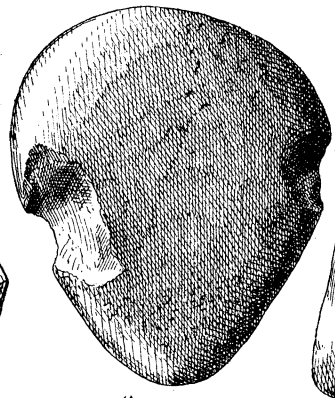

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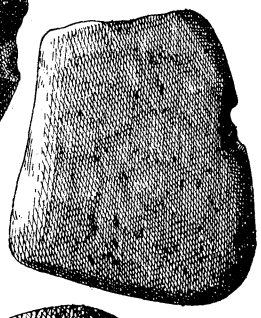

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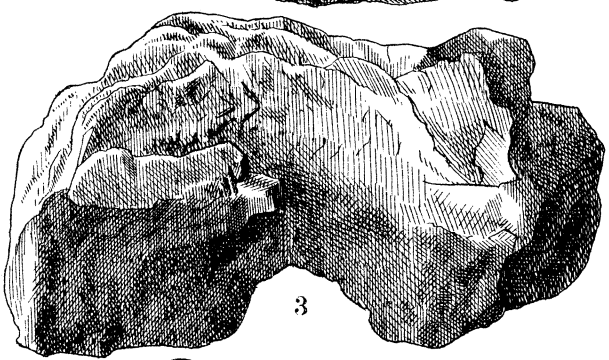

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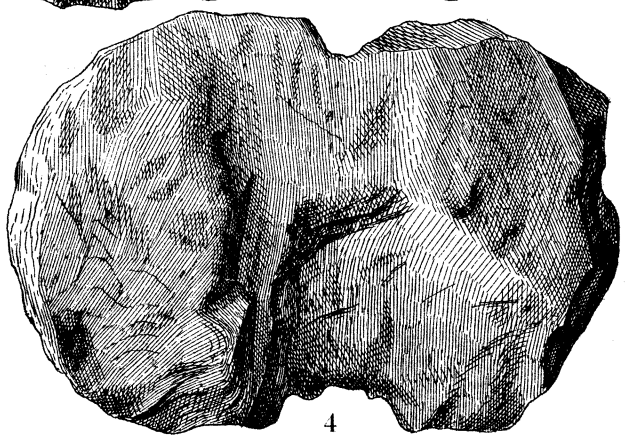

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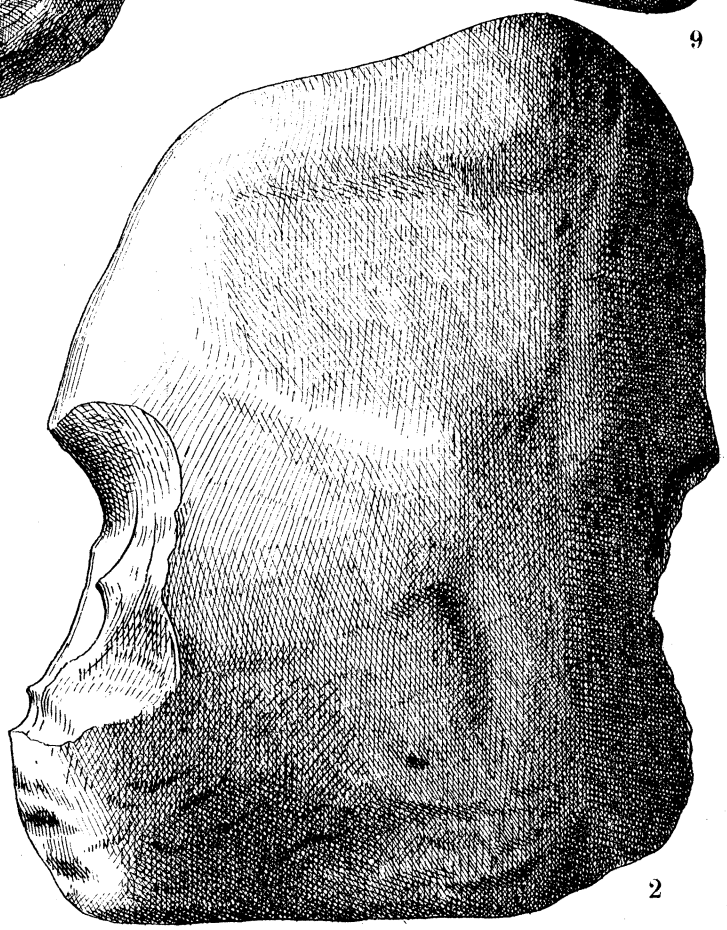

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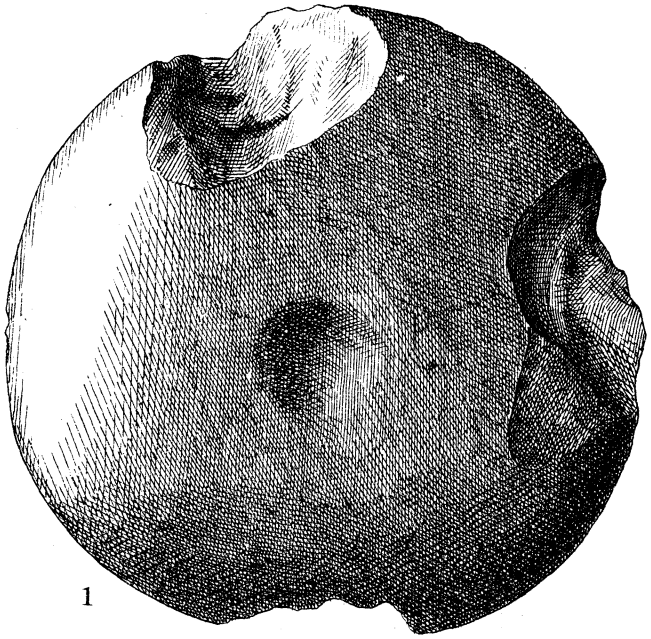

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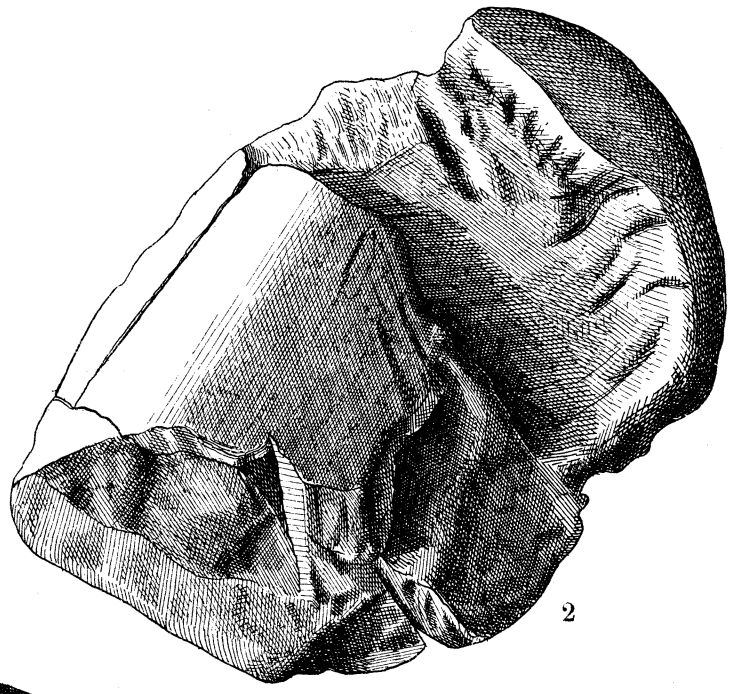

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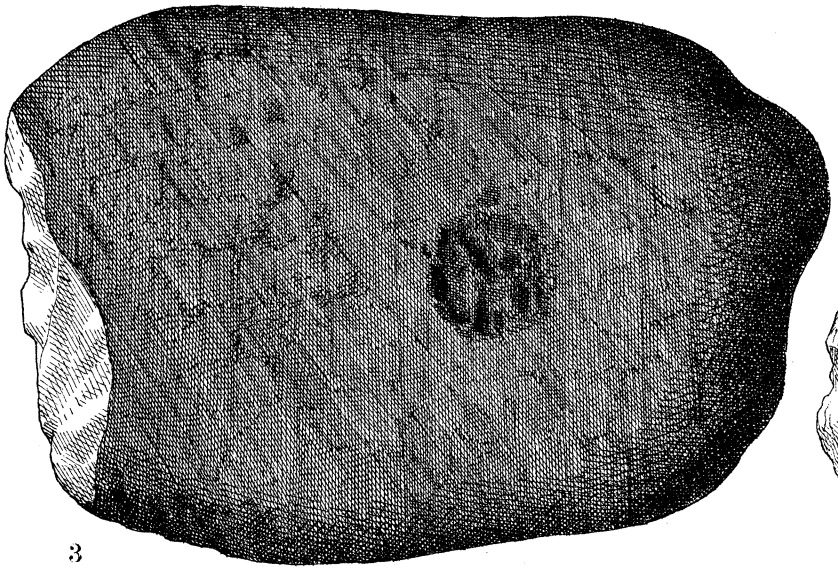

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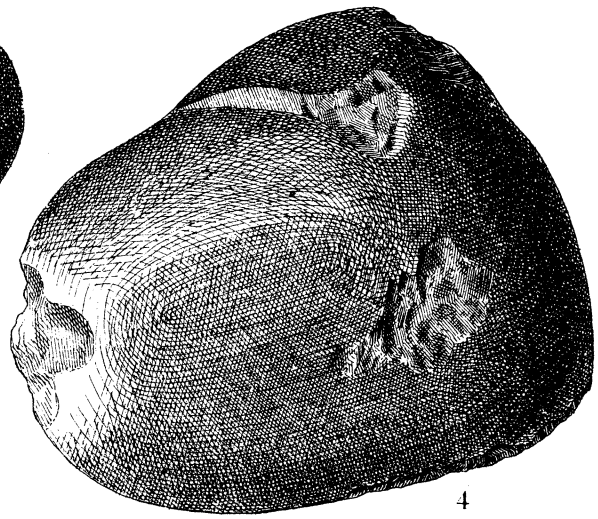

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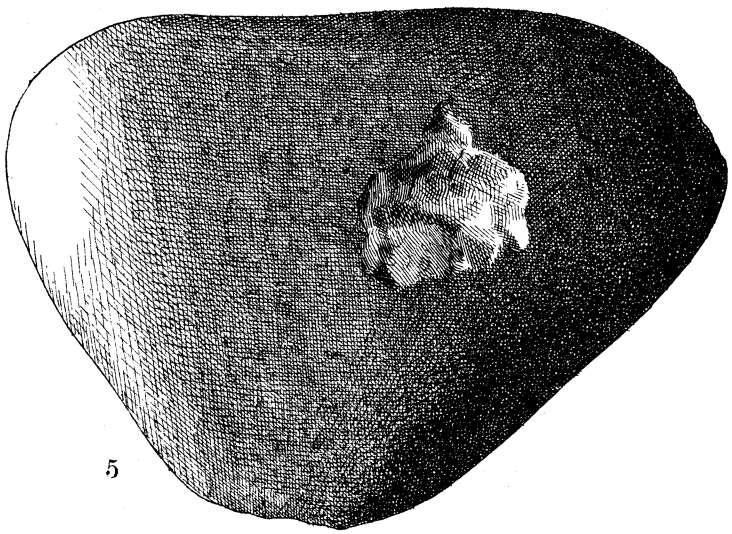

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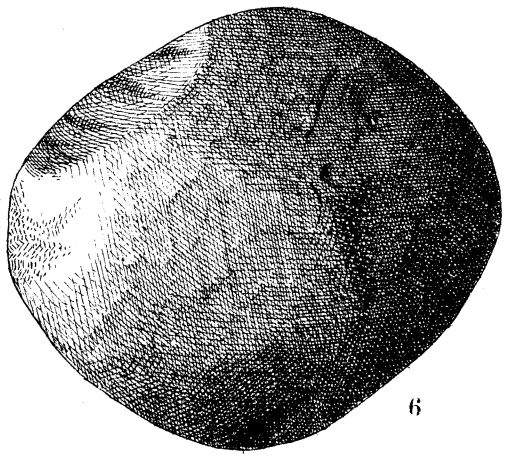

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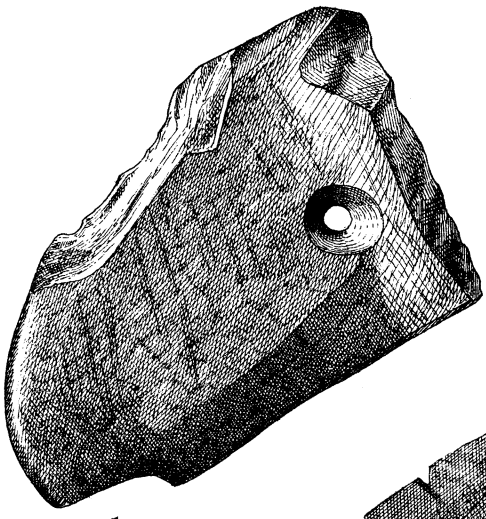
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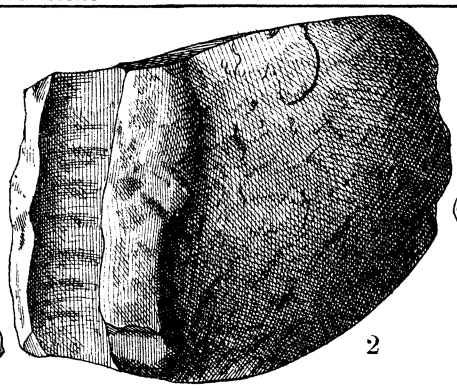
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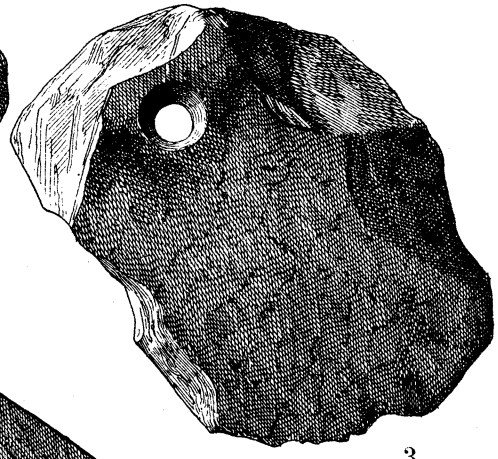
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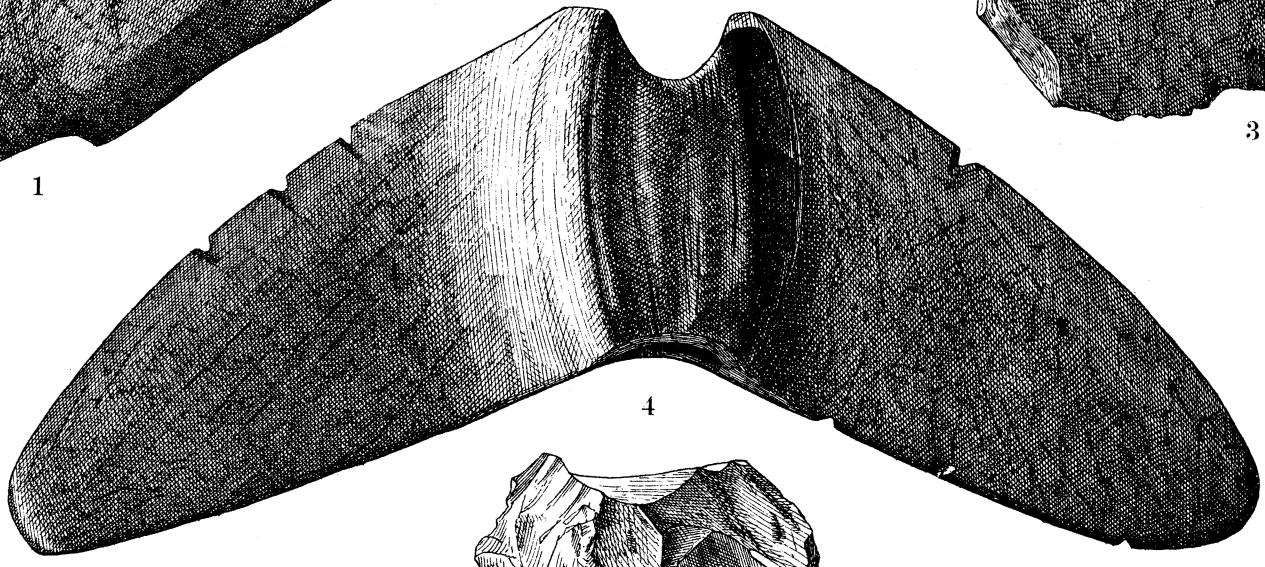
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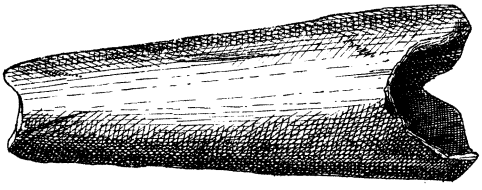
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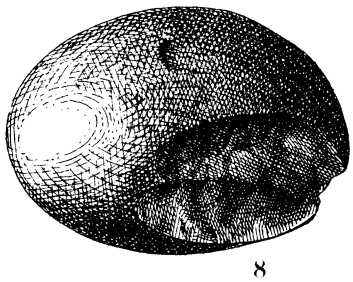
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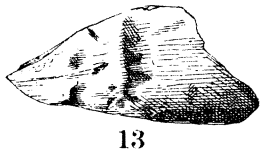
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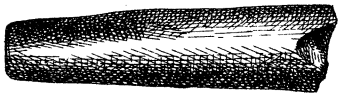


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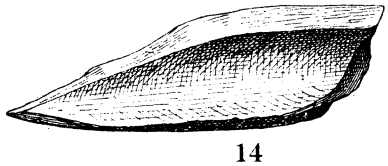
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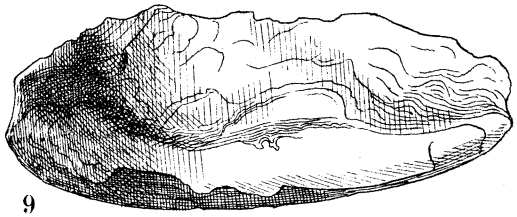
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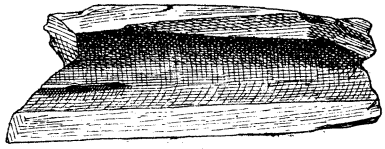
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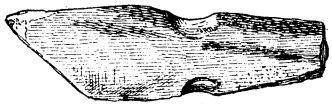
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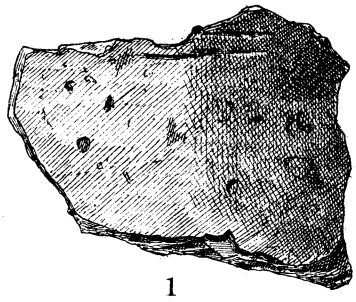
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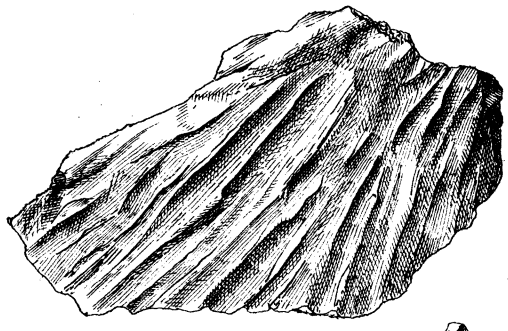
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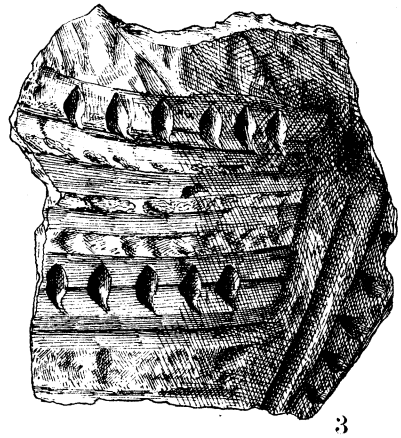
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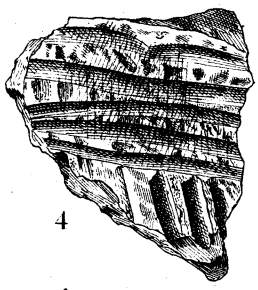
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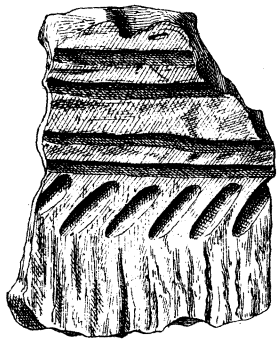
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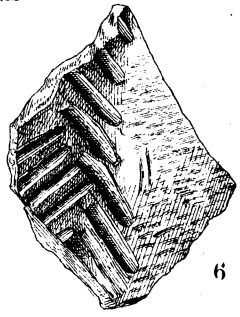
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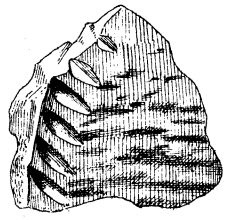
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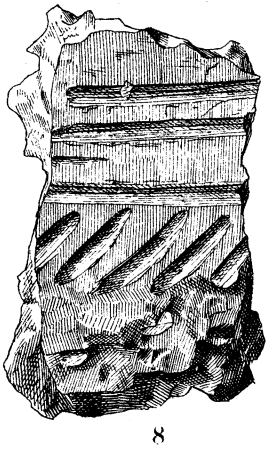
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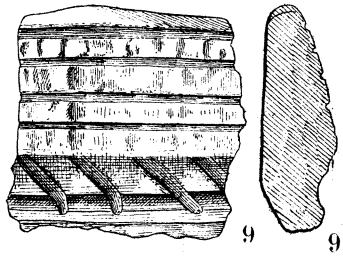
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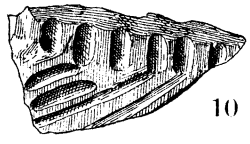
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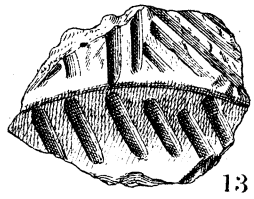
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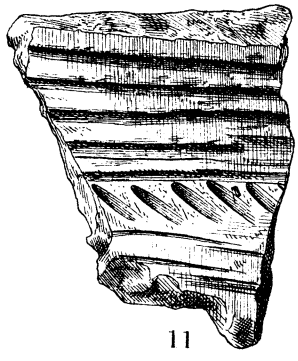
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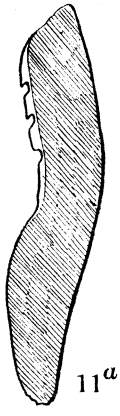
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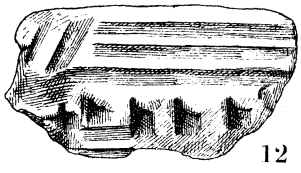
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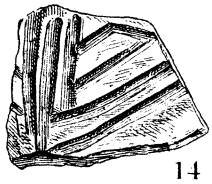
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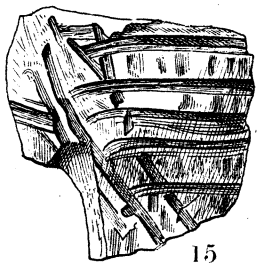
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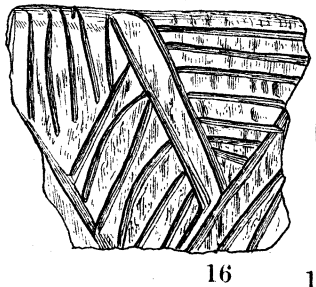
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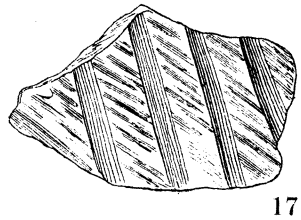
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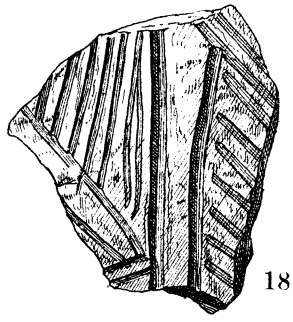
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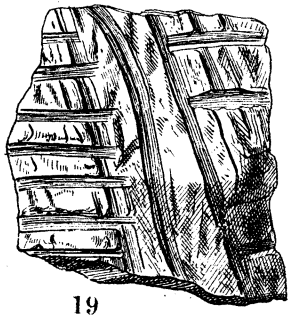
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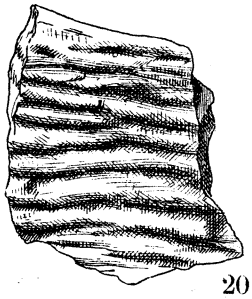
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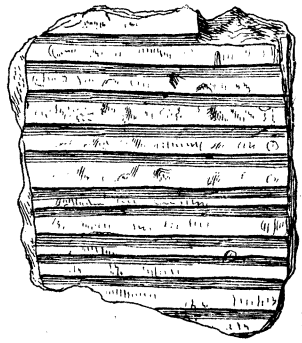
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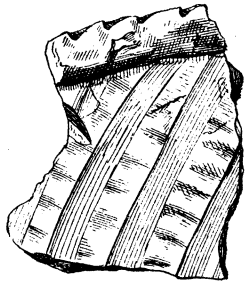
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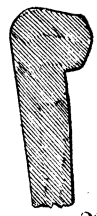
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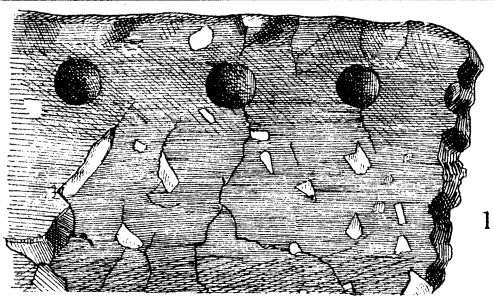

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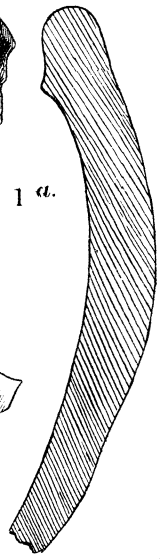

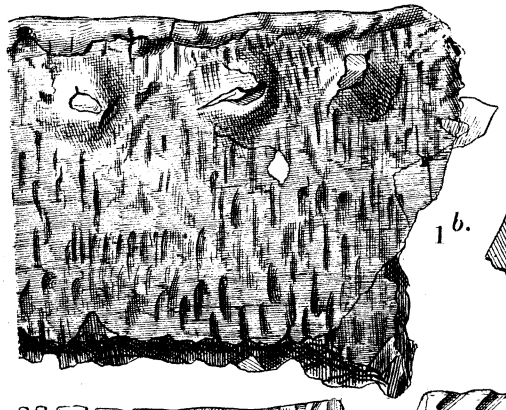

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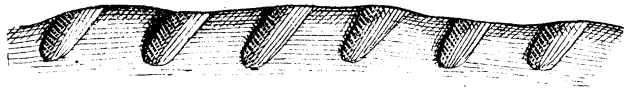

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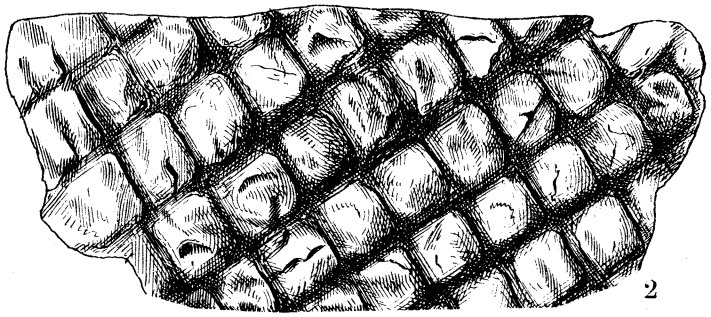

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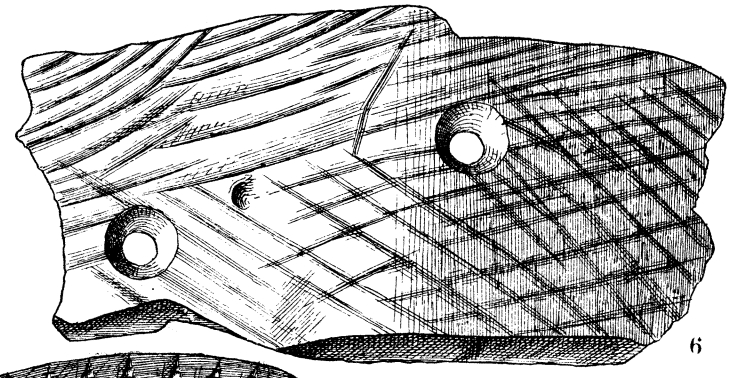

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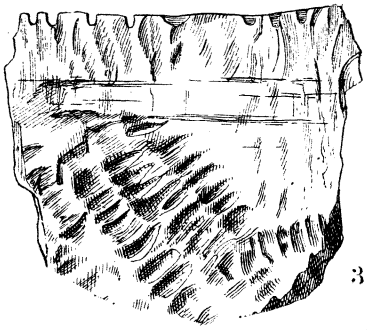

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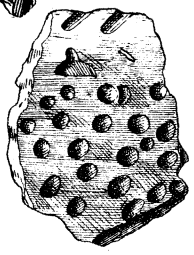

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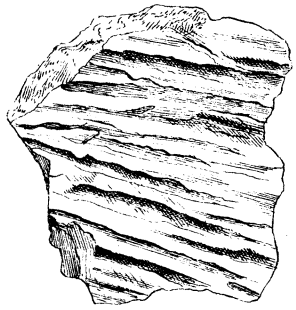

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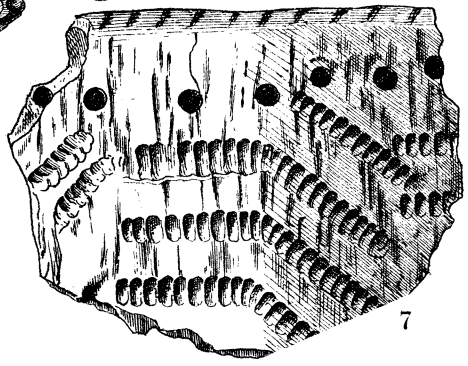

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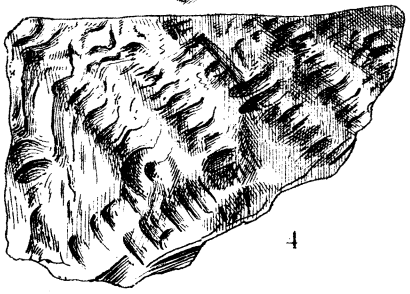

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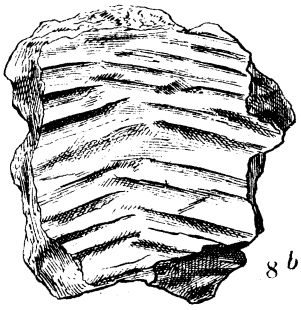

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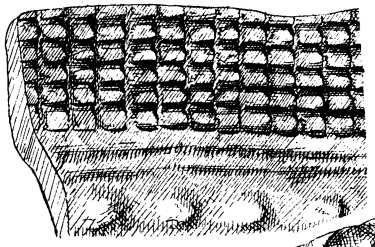

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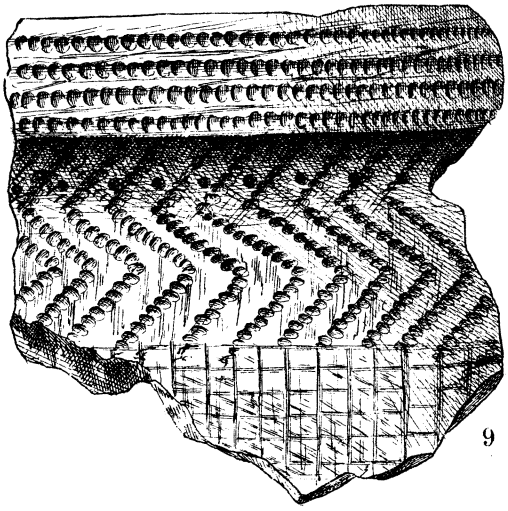

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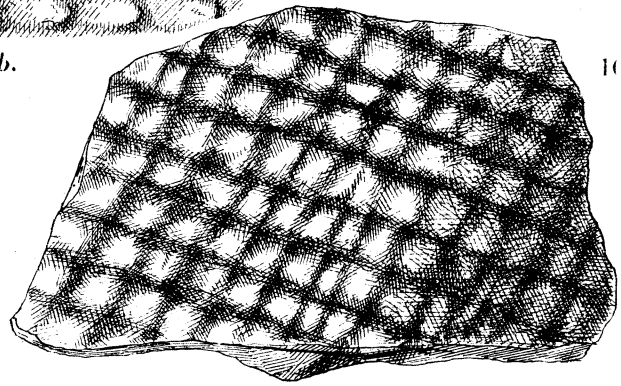
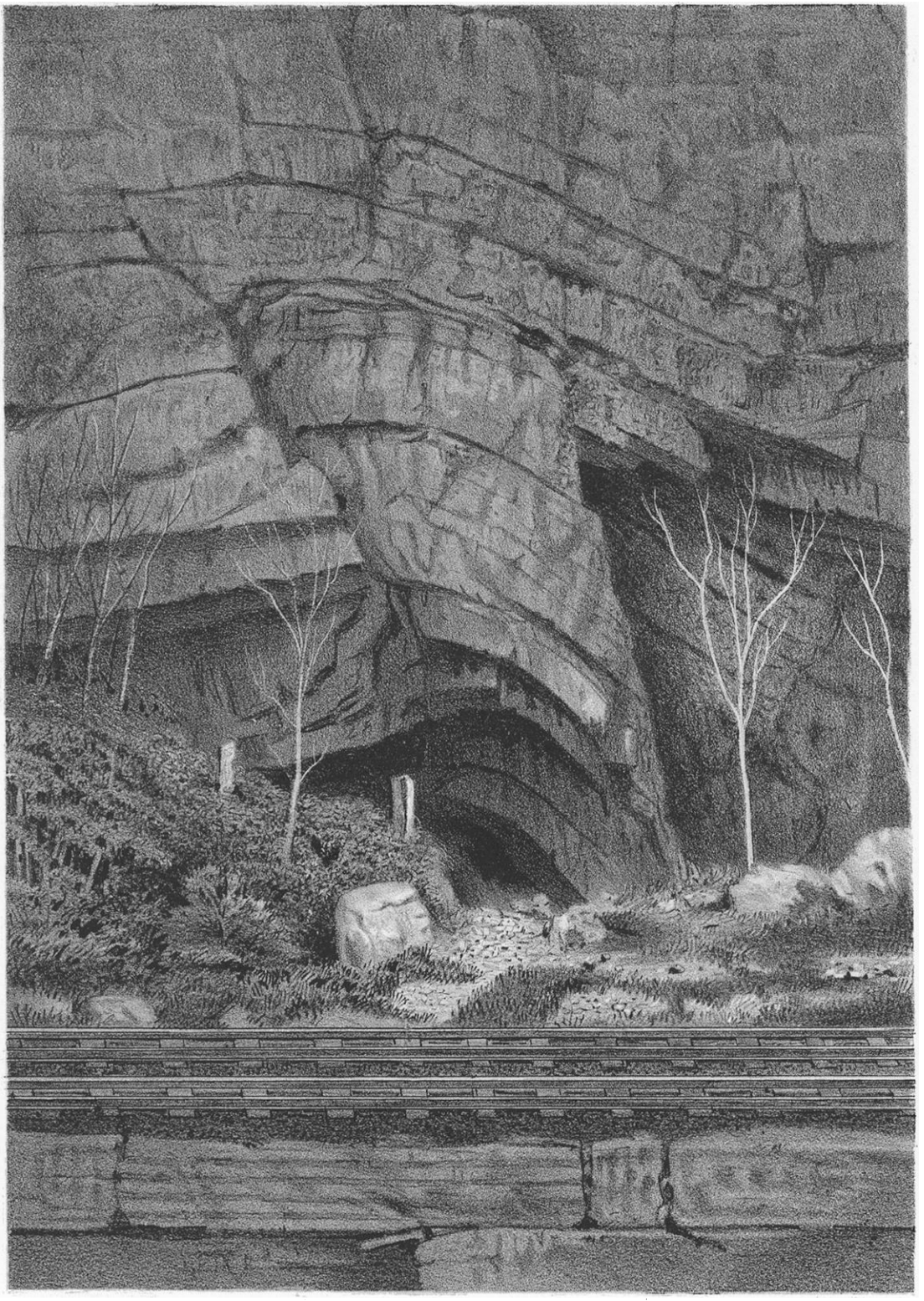


10

D. A. PARTRIDGE, PHOTO-LITH., 624 ARCH ST., PHILA.



T. Sinclair & Son, lith. Phila.

CHICKIS ROCK RETREAT.